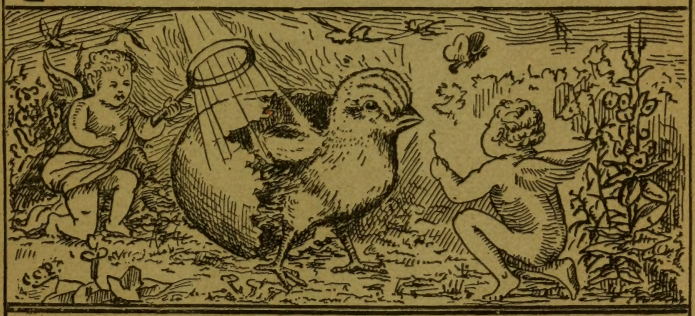
SIXTEEN YEARS EXPERIENCE IN ARTIFICIAL POULTRY-RAISING



SPRINGFIELD, MASS.:
THE PHELPS PUBLISHING CO.
1886.

Something to Make Your Hens Lay.

ANIMAL MEAL

FOR FOWLS AND PIGS.

Made from Fresh Meat, Fresh Bones, dried and ground to a sweet meal, to which is added Parched and Carbonized Grain, making a sweet, stimulating, and highly nutritious food which Fowls and Pigs eat greedily.

There is a universal want among farmers and poultry-men for something to make hens lay during the winter months; for the profits of keeping poultry mainly depend upon a liberal egg production throughout the season. Experienced persons are aware that there is nothing better for this purpose than meat, yet few are so situated that they can procure from home resources all that it would be profitable to feed, and there is a general want of something in a cheap and convenient form to answer this purpose. To supply this want we have prepared the Animal Meal, an article which has been extensively used by practical men for several years, and given excellent satisfaction. It is made from fresh, lean meat, and bones cooked and dried by steam to dry, sweet meal.

HENS LAY When fed with this Animal Meal very soon after feeding it to them. As an egg-producing food it is the best thing that has ever been prepared, possessing as it does all the stimulating qualities of fresh meat, to which are added the stimulating qualities of parched and carbonized grains, which are known to be especially good to make hens lay, and also a portion of bone which furnishes lime and phosphate for the shell in abundance and in precisely the right form.

PROMOTES HEALTH. The Animal meal will be found excellent for fowls in confinement, and, if properly cared for in other respects, fowls fed upon this meal will do as well in small yards as those which have a wider range. It prevents feather-eating, and often cures fowls addicted to this habit. Fowls properly fed upon this Meal will lay no soft-shelled eggs, and they will also moult easily.

PRICES:	Trial Bags of 15 lbs.	50c	100 lb. Bag,	$2.50
	" " 30 "	$1.00	1 bbl. 200 lbs.,	5.00

Ground Oyster Shells for Fowls.

This is made from oyster shells, thoroughly washed, dried and made sweet, then reduced to the size that passes easily through a screen of one-half inch mesh. It is liked very much to feed to poultry to supply lime, and as a substitute for bone, being cheaper. It is now very extensively used, and no person keeping fowls should be without it. 25 lb. bag, 30 cents. 50 lb. bag, 60 cents. 100 lb. bag, 75 cents.

Bowker's Bone Meal for Cattle.

This is made from carefully selected bone, reduced to a meal, white, clean, and perfectly sweet. Many farmers claim that the feeding of bone meal will prevent abortion in cows. This is no doubt true; and it should be more generally fed to cattle, especially cows with calf, which take to gnawing boards, the ground, or old bones and boots. It will also furnish the phosphate of lime, especially needed in growing stock to build up the bone structure; also to supply the phosphate of lime removed from the system in the milk. It is estimated that a dairy cow requires during a year at least 50 lbs. of phosphate of lime, in which case the feeding of bone meal must be very beneficial, particularly when craved on the part of the animal. It is also claimed that it will prevent and cure "Cripp e-Ail," which is the weakening of the joints and bones, and no doubt the result of not feeding sufficient bone-forming food, like bone meal. Feed from a table spoonful to one-half pint at a time, as long as the animal seems to crave it. Most cows and growing stock will lick it down as they do salt. With some, however, it will be necessary to feed it with grain. 10 lb. bag, 50 cents. 25 lb. bag, $1.00. 100 lb. bag, $3.00.

BOWKER FERTILIZER CO.,

BOSTON AND NEW YORK.

SIXTEEN YEARS' EXPERIENCE

—IN—

ARTIFICIAL POULTRY-RAISING

—BY—

JAMES RANKIN,
SOUTH EASTON, MASS.

EDITED BY
HERBERT MYRICK,
Agricultural Editor of THE NEW ENGLAND HOMESTEAD (weekly), and FARM AND HOME (monthly).

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SPRINGFIELD, MASS.:
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PART FIRST.

SIXTEEN YEARS' EXPERIENCE

—IN—

ARTIFICIAL POULTRY-RAISING.

—BY—

JAMES RANKIN.

INTRODUCTION.

Artificial incubation is not, as many suppose, of recent origin, but was in successful operation thousands of years ago in Egypt. The celebrated egg-ovens of that country are a matter of history, but the secrets of their success have never been fully divulged. A close investigation of the subject shows that the management of these ovens was confined to a certain class and its secrets carefully transmitted from father to son. The eggs were brought to the ovens by the country people, who at the end of the three weeks returned, paid their fees and took their chicks—some fifty to seventy per cent, according to the fertility of their eggs. The real truth of the matter is, that the men, by long practice, had become so expert in the business that in a climate where the average temperature was but a few degrees below that required for incubating the egg, it was a comparatively easy matter to keep an even heat, simply using the body as a thermometer.

This, in our climate of ice and snow, would be quite a different thing and next to impossible. Besides, the enterprising Yankee of the present day has got the impression that his time is of more value than that of a sitting hen, and has invented ma-

chines that not only regulate their own heat automatically, and generate their own humidity of atmosphere, and with a very little attention on his part, hatch his chicks for him without in anyway interfering with his regular business.

Incubators have been in use in this country for more than thirty years, and in England, France and Germany for nearly a century, but with so little success that the business has not been considered practical even by the most sanguine. In years past thousands of these machines have been thrust upon a credulous public, whose only use seemed to be to disappoint their purchaser and addle his eggs, and if possible increase the antipathy which already exists in the public mind against incubators. Within a few years, great improvements have been made in the construction and regulation of these machines; so much so, that there are some now upon the market that in the hands of the average man or woman, not only do better work, but are more reliable than the best hens. There are many others which though successful in the hands of their inventors themselves are of no use to the general public.

For the past thirty years I have been engaged in growing thousands of chicks and ducks yearly; the first fourteen years of that time hatching and growing them in the natural way, but for the last sixteen years have been using incubators of different patterns. The result of this experience is, that I consider hens essential to furnish eggs, but a nuisance for hatching and growing chicks. I propose in the following pages to give the readers my actual experience with incubators during the past sixteen years. I am aware that in so doing I shall advocate many points which the manufacturers of other incubators flatly contradict in their instructions, but I shall advance nothing but sound theory, confirmed by actual experiment, and when the reader has acquainted himself with my miserable failures and the success I have achieved through these experiments, he will be in a condition to draw his own conclusions.

CHAPTER I.

MY FIRST EXPERIENCE WITH INCUBATORS.

THE OLD WAY—SETTING HENS—TENDING THE MACHINE—DISASTROUS RESULTS.

In the year 1868 quite an excitement was created in poultry circles in the vicinity of Boston by the introduction of an incubator. The manufacturer claimed that it not only hatched as well or better than hens, but that it regulated its own heat, required little or no care and attention and could be easily operated without in anyway interfering with one's regular business.

Now this was just what I had been looking for. I had been engaged in growing poultry from boyhood and at the time spoken of had gotten the fever badly. For some ten years previous I had been in the habit of getting out from twelve to fifteen hundred chicks and ducks during the spring months of each year by the old hen process, and it had not always proved satisfactory. For though I could always find a ready market for early spring chicks at from sixty to seventy-five cents per pound at the club houses and first-class hotels in Boston, I could not always induce biddy to commence business in time to furnish them. She was carefully fed, fancy nests were fixed up in the nooks and corners and filled with porcelain eggs; in fact every facility was afforded her as an inducement to begin, but with only partial success.

Then again, during the months of May and June, when we wished to retire from business, the nests were invariably filled with persistent sitters. There was a constant battle with water-barrels, red rags, solitary confinement on the one side and persistent obstinacy on the other. I did not then know that the introduction of a vigorous young cock among a yard of sitters, with plenty of food and exercise, was far more effective in in-

ducing a change of mind than more vigorous treatment, cold bath and signals included.

This machine was going to relieve me from all further trouble, and hatch out the chicks just when they were the most valuable. I visited Boston and saw the machines in operation. The eggs were taken out and broken at different stages of development. Everything appeared to be satisfactory, a five-hundred egg machine was purchased, taken home and set up and in due time filled with eggs, precaution being taken to set fifteen or twenty hens at the same time. These hens were intended to accommodate the machine chicks in addition to their own. The machine was a very expensive one, and I soon found, it had at least two good qualities: It was most thoroughly built in every part and could generate all the heat needed to incubate eggs in a temperature below freezing point.

I soon found, however, that the difficulty did not consist so much in generating the heat as in controlling it. The regulating apparatus consisted of a glass syphon, some two feet long filled partly with alcohol and partly with mercury; the alcohol being inside of the machine and the mercury outside. In this mercury was inserted a wired cork. The heat was expected to expand the alcohol, force up the mercury and raise the cork. Now as this cork was attached by a small wire to the ventilator and by a second wire to a cut-off on the lamp and worked simultaneously on both, the least expansion or contraction of the alcohol by heat or cold was expected to control the heat in the egg chamber. But unfortunately the alcohol was placed in the extreme bottom of the machine, where there was the least heat, and the eggs in the top where there was the most heat, so that, as the heat increased the eggs got the benefit of it first and the liquor afterwards, the damage was done before the remedy was provided.

I wrote to the manufacturer stating the difficulty. He assured me that the machine was all right and that the trouble was in me and entirely the result of my own ignorance and inexperience, and that I would soon get the hang of it. This was not consoling, but I resolved that if there was any virtue in persistency, I would succeed.

I will here digress enough to say that a course of twelve years with that machine did not give me experience enough to run it without the regular nightly visitations. The thing sat like an incubus on my shoulders, and during the four months of each year I never knew the luxury of sleeping a single night without being obliged to get up, dress, and wend my way to that incubator room, often in storms or wallowing through snowbanks sometimes with the mercury below zero. But I did not flinch. I resolved that if a failure it was, it would not be through me.

During this time the twenty hens were properly cared for. My habit was to take off the birds during the extreme cold weather in the warmest part of the day and during the fifteen minutes they were off feeding and dusting, the eggs were carefully covered

with a circular piece of paper so that when the birds were returned to the nests the eggs had cooled but a few degrees. At the endof twenty days there was a great chipping and chirping under the hens, and at the close of the twenty-first day more than two hundred lively Brahma chicks had made their appearance, but there were no signs of life in the machine. I felt much discouraged about this, because experience had often taught me that when chicks came out forty-eight hours behind time, their number was sure to be small and their life short. During the twenty-second day a faint chirping was heard and a few eggs pipped. At the close of the twenty-third day about thirty chicks, with my assistance, made their appearance; without that, they never would have seen the light of day. They were a sorry looking set at best. The down was plastered to their bodies by a sort of mucilaginous secretion from the eggs. They seemed lifeless and debilitated and when consigned to the old hen, kept her in a constant fever with their sickly plaints. They refused to eat, dropped off one by one and were soon a thing of the past. All this time their natural and more favored brothers were doing first-class work as far as consumption of food and growth were concerned.

CHAPTER II.

MY FIRST EXPERIENCE CONTINUED.

"I TOLD YOU SO"—KEEP THE INCUBATOR A SECRET—NOT DISCOURAGED—INSTRUCTIONS FOLLOWED—MORE FAILURES—THE FORLORN HOPE—THE MACHINE CHICKS SHUFFLE OFF—RESULTS OF CAREFUL WORK.

Well, my first attempt at artificial incubation had proved a disastrous failure. Biddy had come out a long way ahead, and to add to my trouble, my neighbors, who had looked on incredulously from the first, now began to console me with the old refrain: "What did I tell you?"

By the way, I advise every one who intends purchasing an incubator to keep it a profound secret from his neighbors. Call the thing a "cold blast refrigerator," or anything you please, but keep the neighbors out of the way until you have a good hatch, then invite them in to see the chicks come out. If you happen to have a poor hatch, and they should find it out, as they always will, you will feel like whipping somebody.

My courage, though somewhat abated, had not all oozed out. I was resolved to try again, yet I did not see how I could improve upon what I had done. I could get neither advice or consolation from the inventor. The instructions were few and simple, and I had followed them to the letter. "Trim your lamps once and turn your eggs twice a day. Run your machine at 103°. Change your trays twice each day, putting your lower ones above and your upper ones below each time. Be sure and cool your eggs off fifteen minutes each day, taking them out of the machine to do it. Keep your evaporating pans full of water."

My machine was again filled with eggs, twenty-five dozen more were consigned to the care of brooding hens at the same time, and the same routine carried out as before, though the de-

tails, were if possible, more carefully observed than ever. In the meantime the business was conducted in the natural way the same as of yore. Whenever a hen became broody she was supplied with eggs and I had forty or fifty sitters constantly at work. In due time the hens that were set with the machine duplicated their former hatch. The machine did the same and came out as far behind as ever.

That machine was filled a third and fourth time with no better success. A fifth time it was filled with duck eggs, out of which I did not get a single duck, except two or three which I picked out, and those died at once, while my hens that behaved themselves, got out an average of eleven ducks out of every twelve eggs intrusted to their care.

It thus was an open question in my mind whether artificial incubation under the most favorable circumstances could be made

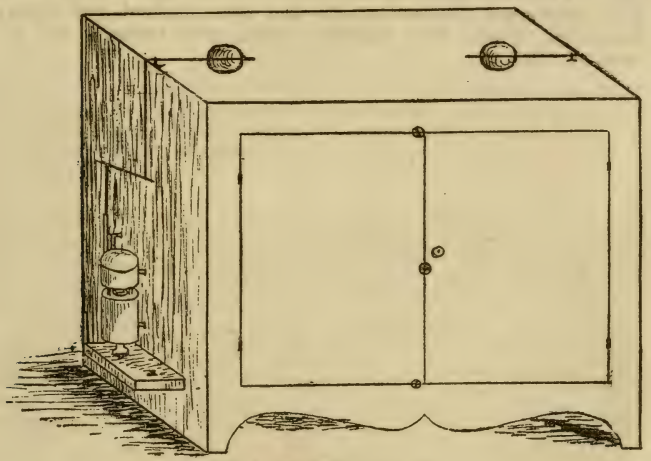


Fig. 1.—My First Incubator.

a success. I had put nearly two hundred dozen eggs through that machine. Those eggs were worth the greater part of the time fifty cents per dozen. (That was the price I obtained for them the entire winter from private families in Boston, they paying the express.)

Out of that two hundred dozen eggs I had got out less than two hundred sorry-looking chicks. Those chicks had come out apparently in all stages of development, and in every conceivable deformity. There were crooked legs, twisted bills, humpbacks, clump feet. Numbers came out with the digestive organs attached on behind like the antennæ of a wasp, outside of the chick instead of inside, where it ought to be. One in particular introduced himself with one leg below and the other on his back

above, both so attached that he could make use of neither. Those machine chicks, unlike their natural brothers, had a strong antipathy to locomotion; activity was their aversion. Their general aspect was that of profound meditation. Their favorite attitude was reclining on their broadside. They were bound to shuffle off this mortal coil at all hazards and no amount of petting or coaxing could induce them to reconsider their decision.

I have my doubts to-day if I succeeded in maturing a single one of those machine chicks. There could be no fault with the eggs or the fowl from whence they came. In an experience of thirty years, I have never had so highly fertilized eggs during the winter months as during these trials; fully ninety-eight per cent were fertile. Hens that behaved themselves came out with broods of from ten to twelve chicks and sometimes hatched every egg. On May 1, in summing up the winter's work, the account was thus: From one hundred and eighty dozen eggs consigned to hens, nearly one thousand chicks and two hundred and eighty ducklings. From two hundred dozen put through the incubator, 00.

CHAPTER III.

IMPROVING THE INCUBATOR.

I DO SOME THINKING—A VITAL ERROR DISCOVERED—THE PROS AND CONS OF COOLING EGGS—SUCCESSFUL EXPERIMENTS—I AM JUBILANT AND PREDICT GREAT THINGS—PRIDE HAS A FALL BUT SOME ADVANCE IS MADE—NO DOUBTS ABOUT ARTIFICIAL INCUBATION—I REBUILD THE MACHINE.

During this time I had done some thinking. There was plainly a cause or causes for these failures. It was for my interest to discover and remove them or else throw aside the machine as worthless, which I was not yet prepared to do. It had cost too much money for that.

There was one thing that was entirely amiss. The machine chicks had invariably come out behind time and yet I had repeatedly put glasses under hens to ascertain the temperature, which I found about 103°, and then run the machine the same. But I found that when the five hundred eggs were taken out of the incubator and cooled off in a cold room for fifteen minutes, that when they were returned to the machine there was such a large body of them that the eggs seemed to cool the air in the machine instead of the air warming the eggs; so much so, that when the room was cold, it was often three and even four hours before the eggs reached their normal heat. Thus in reality I had been running at a temperature of from 75° to 103°.

How had biddy been running? I would find out about that. A hen was taken off the nest for fifteen minutes and then returned; when finally settled down, a glass was carefully placed under her. In twenty minutes those eggs, brought into immediate contact with the rapidly pulsating arteries of the hen's body, were back to their normal heat of 103°. Here was a solution of the difficulty and yet my instructions were imperative to cool the eggs fifteen minutes each day. But I found that cooling the eggs

fifteen minutes at a temperature of 40° did as much execution as cooling them fifty minutes with the room at a temperature of 80°. Evidently things were mixed at headquarters.

It now occurred to me that though cooling off the eggs might be a necessity to the old hen, it might not be at all essential to the welfare of the embryo chick. Nothing easier than to find out. I would run an experimental machine for the purpose and settle the thing once for all.

I procured three paper-box covers, perforated the bottom with holes, and placed them in the machine in the centre of the drawers with a dozen eggs in each.

One box of those eggs was taken out daily and cooled to the usual temperature. Another was taken out and cooled while trimming the lamp, about three minutes. The other box was not taken out during the hatch, the eggs being turned in the machine. The result of that experiment was six chicks from the box of cooled eggs, and dead chicks in the other six eggs, in all stages of development.

The box taken out for a moment or two, hatched ten chicks and two died in the shell. From the box that was not moved, I took eleven lively chicks, the remaining egg being unfertile. Those eleven chicks came out with that fine yellow tinge which characterizes your healthy Brahma chick hatched in the natural way.

To say that I felt relieved does not express it. I was jubilant. I even went so far as to tell some of my loquacious neighbors that they would see a thing or two when the next season opened.

I made arrangements for an early start the coming winter, as what broilers I had sold had brought sixty-five cents per pound at the club houses in Boston and I did not have enough to supply the demand. I started machines and hens about the first of January, taking every precaution to ensure success. My chagrin may be imagined, when as I had confidently expected at least ninty per cent to hatch, I in reality got but forty per cent. The rest of the eggs contained chicks dead in all stages.

It was true it was a decided improvement on the last winter. I had got three times as many chicks and they had come out stronger and were doing well. They had also come out in time, which was a great point. I tried a second hatch with the same result, biddy coming out as usual.

I had no longer doubts about the success of artificial incubation. Those eleven chicks the previous year had proved it beyond a doubt. Notwithstanding the inventor's assertion, I believed the trouble was in the machine and not in me, because I had heard in a roundabout way that he himself was not doing any better than I was; in fact, not as well, and I found that a great many others were victimized with it like myself.

In an unfortunate moment, just after I was through with that experimental hatch the season before, the inventor had writ-

ten me for a testimonial, and being elated at the time, I wrote him that I had just got a one hundred per cent hatch. Of course he made a free use of it, and it materially assisted him in victimizing others.

Being thoroughly convinced that the machine was at fault and not myself, I overhauled it in every part. I found that the egg-chamber was heated by perpendicular tanks on all sides except that occupied by the door in front; also by a tank over the top.

The machine was ventilated through the tank over the top, in the centre of the egg-chamber, the cold air being admitted through the doors in front. By this arrangement at the back of the egg-chamber where it was all tank and constant heat radiating therefrom, there was no ventilation, while in front, where there was no heat, was located all the ventilation.

It was easy to see now where the trouble was. But why had I not seen this before? I had blindly thrown away hundreds of dollars' worth of time and eggs during the first two years. I wrote the inventor plainly stating the defects in the construction of his machine and asked him if he would not remodel it to suit me. He answered me by asking if I pretended to know more about the machine than the manufacturer who invented it.

I purchased a dozen glasses at once, resolved to know the extent of the trouble. I placed those glasses in every part of the egg-chamber. I found that while the temperature was 103° in the centre it was 109° at the back and sides, and 100° at the front; and while the glasses represented 103° on the upper trays, the lower ones represented 98°.

This at once accounted for my previous failures. I then closed up the draft in front, and drawing the water out, bored holes through the tank in the back and sides, admitting ventilation where it was needed most, filling up the tank to just below the egg-trays. This evened up the heat in the egg-chamber to a great degree and decidedly increased my percentage of eggs hatched.

CHAPTER IV.

THE OLD, OLD STORY.

NOT SATISFIED—NEW SELF-REGULATING INCUBATORS—THE OLD DIFFICULTY, UNEVEN TEMPERATURE—RECENT IMPROVEMENTS.

But this was not satisfactory, for though I was tolerably sure of from sixty to seventy per cent of the eggs hatching, yet I could use but one tray, thus cutting the machine down to one-third its original capacity, which made a very expensive machine of it. I ran this incubator in connection with hens for a number of years, and they made about an even thing of it.

Sometimes when I over-slept myself, biddy would come out a little ahead; and again, when she would prove refractory, smash eggs and give up the business just before the hatch was due, the odds would be in favor of the machine.

I was dissatisfied with this state of things. Sad experience had taught me what the requirements of a good incubator were. How to get them all in one machine was the difficulty. In the meantime, a number of new machines had been invented in different parts of the country, all claiming to do first-class work, and to completely supercede the old machines which were denounced as worthless. The heat in these machines was regulated by batteries, thermostatic bars, etc., even to the fractional part of a degree. The machines were accompanied by testimonials from different parties, apparently genuine, claiming eighty, ninety, and even one hundred per cent hatches.

I now thought my time had come, though I had done fairly well with my machine for a number of years, yet I did not get first-class hatches and there was altogether too much night work connected with it. I was ready to buy another machine, if it was as represented; and as some of them had drifted into the adjoining counties, I thought I would go and interview the owners of these machines, and by personal investigation satisfy myself as to their merits.

One man said that he had put in a few eggs the first time and hatched a pretty good percentage of them, and then filled up his machine and somehow the battery got out of fix and he did not hatch anything, but at the present time it was running nicely.

On visiting another of different pattern (also run by battery), the operator said that he had put in a small number of eggs and hatched nearly one hundred per cent. (By the way *his* testimonial had particularly attracted my attention). But when he had put in a large number of eggs his percentage was much smaller. In fact the greater the number of eggs the smaller was his percentage of hatch.

I thought of my own experience several years before. With the owner's permission I introduced glasses in different parts of the machine. It was as I expected: no uniformity of heat in the egg-chamber. The worst feature of my investigation was that there were very few chicks to be seen and those few had a strong resemblance to some of mine I had got out in similar manner six or eight years before.

There was one exception, however. One man had about one thousand chicks, but as he had also some seventy-five to one hundred hens sitting at the same time, I was not sure of their origin. I did not find things as favorable as I expected, for on comparing notes the balance was decidedly in favor of my own machine.

Let it be here understood that I do not wish to detract anything from machines run by electricity. Some of these machines have become greatly improved, as well as their batteries, and are really doing good work. Others still have been more recently invented and now stand side by side with the older machines.

CHAPTER V.

A HOME-MADE MACHINE.

I BUILD AN INCUBATOR—IT HAS SOME GOOD AND SOME BAD POINTS —REMEDYING THE DEFECTS.

I had now either got to run the old machine or make something better myself. I had had experience enough in this business to know what the requirements of a good incubator were, but how to get them all into one machine and have them work together harmoniously was something that had puzzled brighter heads than mine.

During the autumn of 1878, I constructed a machine in the shape of a parallelogram, with the hot water flowing through a tank above the egg-trays and returning through a pipe which wound round the machine several times, next the outside, and entered the bottom of the boiler. This tank was so constructed that the warm water flowed next the sides and the centre. Though it was filled with water; as it was still water, it radiated little or no heat. I had always noticed that the centre of a machine was invariably the warmest, and my object was to obviate this difficulty as much as possible. I also constructed concave egg-trays with a depression of about two inches in the centre, thus removing the eggs that much further from the tank in the centre of the machine, my object being to even up the heat on the eggs.

This worked very well in one direction, but badly in another; for when the chick pipped in the bottom of that concave, he stood a very poor chance of getting out with so many eggs pressing down upon him from above. The only chance for these pipped eggs was to place them on the outside above. This required constant care during hatching, or a great loss of chicks was the result.

This machine, though regulated in the same way as the old one, ran much steadier and did far better hatching, my average being eighty per cent. After running it two years in connection with the old one, I saw where great improvements could be made and resolved to build another machine on a different principle.

On examining the eggs that did not hatch, (some twenty per cent of them), I found them nearly all matured and ready to break the shell but for some reason did not come out. On examining those which did not hatch under hens, I found that these died in all stages, especially the earlier part of the hatch. (These last are the eggs which prove so oderiferous when roughly handled by the boys). This proved conclusively that the machine did better work during the first part of the hatch than the hens, but for some reason they did not come out. This perplexed me the most of anything in the whole business.

Other manufacturers had been troubled in a greater degree than I had, and had settled down finally to the point that it resulted from carbonic acid gas. This was a deadly gas generated in large quantities by the maturing chicks, and unless quickly removed was most fatal in its consequences.

Now we were told that this was a very heavy gas and could not be forced out by common ventilation but must be got rid of by counter currents of air. I had read much about this gas, and not being much of a chemist had got it badly on the brain. Besides, it really accounted for what otherwise seemed to to me inexplicable.

CHAPTER VI.

ARTIFICIAL INCUBATION A SUCCESS.

THE NEW MACHINE—THE TEMPERATURE SUCCESSFULLY CONTROLLED—ANOTHER OBSTACLE—EXPERIMENT UPSETS ALL PREVIOUS THEORIES—ARTIFICIAL INCUBATION A SUCCESS—EVAPORATION AND OTHER TROUBLES—THEY ARE PROVIDED FOR—SOME GOOD HATCHES.

The new machine was built, completely double, with an inch air-space all around it and so arranged with a downward current of air as to force the carbonic acid gas out without in any way interfering with the regular ventilation of the machine. This machine about the middle of December was filled with about six hundred eggs. Things worked admirably for a few days, as it was regulated on an entirely new principle.

Previous to its construction I had been investigating the science of hydrostatics with the view of learning the exact expansion of water through heat compared to that of air; also the amount of water necessary in the tank, that its expansion and contraction might give complete control of the ventilation and lamps of the machine. This would be making the principle which generated the superfluous heat provide for its own escape, thus anticipating all trouble. This regulating principle was applied to the machine. It exceeded even my wildest anticipation. No more night work now. It was really a pleasure to care for it.

But an unlooked for trouble presented itself. The weather, which had been hitherto mild, suddenly changed. The mercury went down below zero, the wind blew very hard and as my machine was located in an out-building I found it impossible to keep up the proper heat.

There had been a defect in the construction of the boilers. The mechanic who made them misunderstood directions and completely reversed the principle desired. Consequently a very

small amount of heat could be obtained and a dense smoke was sure to follow any attempt to secure more. I filled my evaporating pans with hot water, and made a free use of hot bricks, but relief was only temporary, I could not keep the temperature up.

There was but one thing to do, to save the eggs: cover the machine with paper, then with blankets and close up the ventilation entirely. The choice lay between losing the eggs from that deadly carbonic acid gas or from an insufficient amount of heat. The latter I know was surely fatal; of the other I had some little doubt, and concluded to risk it.

That machine was packed during the entire hatch and opened only when the chicks began to come out and must have air. From that hatch I got nearly four hundred chicks, or more than ninety per cent of the fertile eggs. This was by far the best hatch I had ever got in an incubator from a machine full of eggs.

It is needless to say that my faith in carbonic acid gas suffered a great abatement. In fact it has never troubled me any since. I am often thrown in contact with parties who ask where the ventilation is in my machine and how I get rid of that gas. I say that my machine does not generate any, or not enough to injure the eggs. The invariable answer is: The best authorities unite in saying that this gas is generated in large quantities by the eggs, and will surely kill the chicks if not got rid of.

"My dear sir:" I reply, "whenever your *best* hatches excel or even equal my poorest ones, we will argue the matter further; until then, please have me excused."

This always settles the matter.

The question of success in artificial incubation was clearly settled in my mind. The use of hens for purposes of incubation was entirely discontinued. But there was one thing which was not clear. There were still some matured chicks dead in the shell, and although there was but four or five per cent of loss in this way in the dead of winter when eggs were supposed to possess the least vitality, there was sure to be eight or ten per cent during the warm weather of May when eggs were known to possess the most vitality.

This puzzled me, for I knew the machines ran equally as well, and received the same care. I did not thoroughly understand the question of evaporation, just how much or how little the egg required, and I thought that possibly might have something to do with this question.

It is true, the old hen did not use any evaporation, but by means of an oily secretion from her skin and feathers, she imparted a coating or gloss to the egg which effectually prevented its evaporating. I had no way of doing that in the machine, and could only obviate it by an increased humidity of atmosphere in the egg-chamber.

Different machines have different ways of doing this. I have the best success by setting the water-pans on the hot pipes below. This in cold weather always produced moisture on the

glass doors of the machine, while in warm weather this moisture was scarcely preceptible. The reason was obvious.

In cold weather the water in the tank and pipes required to be much warmer in order to generate the proper heat in the egg-chamber, and as water evaporated just in proportion to its temperature, I was getting a great deal more evaporation in cold weather than in warm.

For instance, on putting a glass in the water in the evaporating pans during the winter, they registered 90° to 100°, while in warm weather they registered but 85° to 90°. In the one case the moisture was running down the glass during the entire hatch, while in the other, it was scarcely preceptible. Might not this be the cause of the trouble?

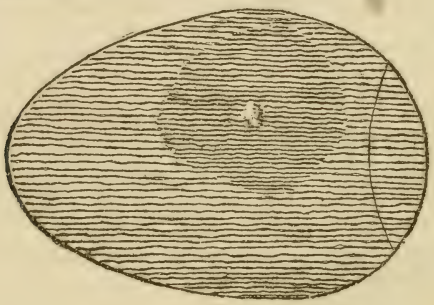


Fig. 2.

The next season, in 1883, as the weather grew warmer, I gradually increased the evaporating surface in the egg-chamber, keeping the glass in the doors moist, and carefully watched the effect. There were less dead chicks than usual; in fact, but three or four in each tray.

A few days later, another machine was started with Plymouth Rock eggs, and the water surface increased still more. Things were kept decidedly sticky in that egg-chamber through the entire hatch. The result was, on one tray, one hundred and fourteen chicks from one hundred and fifteen eggs; on another, one hundred and fifteen chicks from one hundred and twenty eggs. Taking the whole, machine it was fully as good a hatch as I had ever had.

But I had to help at least one-fourth of those chicks out. They were literally packed in the shell. They could pip, but could not turn in the shell. Once out they were unusually large and active.

The trouble was, the eggs did not evaporate during the first week of the hatch, as it is necessary they should do, and as they always do the first few days under hens before the pores are filled with the secretion from the birds feathers.

CHAPTER VII.

THE SCIENCE OF INCUBATION.

THE SCIENCE OF IT—VARIOUS EXPERIMENTS—SPRINKLING EGGS NOT NECESSARY—IT DERANGES THE TEMPERATURE.

Now if no more water surface is exposed in warm weather than in cold, not more than one-half the moisture is secured. Everyone knows that during the last part of a hatch, on well fertilized eggs, not more than one-half as much oil is consumed in the lamps as in the first part; for the reason that the increased animal heat in the young chicks is so great that much less heat is required from the lamps to sustain the needed temperature.

If, then, the water surface is not increased as the heat in the pipes decrease, your chick gets the least moisture just when he needs the most. The effect of this is to evaporate the eggs, weaken the chick, and toughen the inner lining or membrane of the egg which envelopes him. This membrane contracts around his body like thin rubber and imprisons him so firmly that he is unable to turn and free himself from the shell.

In the spring of 1884, I ran an experimental machine of five hundred eggs for the sole purpose of solving the different points of dispute in regard to artificial incubation. Some parties advocate sprinkling as the only true method of generating moisture. Some authorities claim that 103° is the proper temperature to run; others, 104°; others still, 102°. Others claim that there is no need of turning the eggs, and that they will hatch just as well without.

In this experimental machine were placed four trays of eggs: one tray was run at a temperature of 102°; No. 2 tray, at 104°; while No. 3 and No. 4 were run at 103°. No. 4 tray the first week was drenched with lukewarm water twice each day, while in the No. 3 tray were put two paper box covers, each holding two dozen eggs. In one box the eggs were laid in a natural position on their side; in the other they were stood up on their

small end. In neither box were they moved at all till they hatched.

The No. 2 tray, running at 104°, began to pip the nineteenth day, and the chicks were pretty well out on the twentieth day. The down on those chicks was very white and short. Only seventy-five per cent hatched. They were anything but first-class chicks.

In the No. 3 tray which had the boxes of eggs in different positions, which were carefully turned and run at a temperature of 103°, about ninety-six per cent hatched. In the box where the eggs stood on one end, forty-seven per cent hatched, and the chicks were strong. In the other box fifty-four per cent hatched.

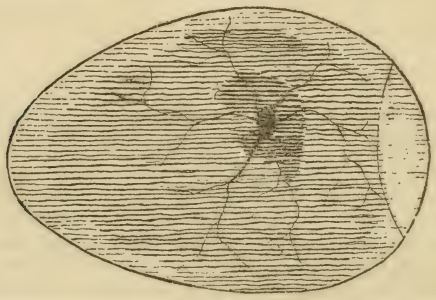


Fig. 3.

The remaining eggs in both boxes had dead chicks in all stages of development. It was a case where the fittest survived.

No. 1 tray came out one day behind time, the last ones requiring some assistance. About eighty per cent hatched and the chicks not particularly strong.

No. 4 tray came out behind time also, about eighty per cent hatching, but not in first-class condition. The reason is, that after eggs are sprinkled the rapid evaporation quickly reduces the heat in the eggs and will cool them from 103° down to 90° in a few minutes, so that in sprinkling twice daily, one is actually running at from 103° to 90°, as it is always an hour or two before the eggs obtain their normal heat.

I have never yet in all my experience been able to get a first-class hatch while sprinkling. The effect of sprinkling has always been with me, to retard the hatch and reduce its percentage. In fact, it cannot well be otherwise, as moisture generated through sprinkling is only periodical, and for the above mentioned reasons is constantly deranging the temperature in the egg-chamber.

CHAPTER VIII.

THE LOCATION OF INCUBATORS.

THE BEST LOCATION FOR AN INCUBATOR—WHY IT IS IMPORTANT—A CELLAR THE BEST PLACE—INSURANCE RATES AND INCUBATORS—THE SELECTION OF EGGS—HOW TO HAVE FERTILE EGGS—GREEN FOOD IN WINTER—KEEPING EGGS.

The best place to run an incubator is either in a house cellar or a barn cellar, for obvious reasons. If your machine is placed in an out-building, or even in a room without a fire, in very cold weather it will freeze around the machine, and taking out and turning a large body of eggs in a freezing temperature twice each day is apt to derange the temperature of the machine and impair and retard the hatch. Then again, outside heat effects such a building as quickly as outside cold, and in the summer time, with the sun shining on the roof, the glass often reaches 90° to 95°. In these circumstances, it is very difficult to run any light at all without running too much heat.

I am well aware that some manufacturers say that it makes no difference to their machines where they are located, as it is the inside heat which regulates their machines and the ventilation is increased correspondingly. But, friends, in a very warm temperature, if you attempt to reduce the heat in your egg-chamber by admitting large volumes of dry air, you are completely destroying the humidity of your atmosphere. Then how about those chicks coming out?

I am at present writing, during the month of June, running four large machines with ducks' eggs. These machines are in an out-building with the sun shining directly on the roof, in which case it is sure to be warmer inside of that building than out. During the last two or three days of each hatch, the lights are put out entirely, the animal heat in the young ducks being all sufficient to run the machine with what little ventilation they need.

It is true I might run one light, but in consequence I should be oblige to admit large quantities of dry air and then the little fellows would have a hard time getting out, and some never will get out without help, which must be given at just the right time.

It is true an expert could run incubators either in a warm or a cold temperature, and even in a place subject to all manner of changes, when a novice would not succeed at all.

Sometimes insurance companies object to incubators being run in insured buildings, and will cancel their policies if persisted in. In that case, it is very easy to dig into the side of a bank or in the ground and stone up a little building for the purpos; the expense would be trifling.

In the selection of eggs for hatching, it is well to reject all very small eggs and unusually large ones, as well as all eggs that are rough on either end, as those eggs are apt to be porous and will be sure to evaporate during the hatch.

One of the greatest advantages in the use of incubators is the power it gives one of hatching his chicks when they will bring the highest price in the market, and as this is invariably in the winter, the essential point of all is to secure good fertile eggs.

Now it is a very easy matter to make hens lay abundantly during the winter. That has been reduced to a fine thing, but to

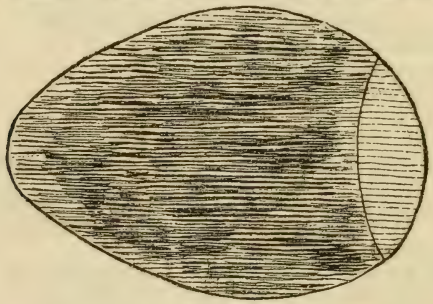


Fig. 4.

make those eggs fertile requires different management altogether. It is very easy to put one hundred to one hundred and fifty hens in a building, allowing three or four square feet to each fowl, and with proper sanitary arrangements, good care and diet, secure large returns in eggs; but under these conditions those eggs will not be fertile.

One reason is the extreme jealousy of so many cocks in one harem. Another reason is the want of exercise, which debilitates the fowl and the consequent lack of vitality in both fowl and eggs.

In order to obviate this, I always clear away the snow in front of my houses, and get the fowls out whenever the weather

will allow and give them all the exercise possible. In the fall, say the latter part of August, I sow a field of rye quite thickly and by fertilizing it freely get it about eighteen inches high, a green mass of vegetation. When frozen hard, and just before the snow covers it, I cut it and pack it in an out-building where it will keep frozen. In this condition it will take no injury and be always available for use, as a few moments exposure to warm air will fit it for use, when it is chopped fine and fed to the fowls.

A free use of this rye, alternating with boiled potatoes and turnips, together with refuse cabbage, which can be had cheaply, and a plenty of exercise, will always produce fertile eggs, the other conditions being right—say about thirty healthy, well developed pullets with two vigorous young cockerels.

In cold weather the eggs should be gathered two or three times a day to prevent their chilling. Eggs may be kept safely for three weeks in cool weather before putting in an incubator, if carefully turned each day. This can be done readily by means of egg cases, which can be turned when partly full as well as when full. A record should be kept of their age, so that no mistakes need be made.

CHAPTER IX.

TESTING THE EGGS.

THE EGG-TESTER—WHAT IT REVEALS—A SAVING OF TIME AND MONEY—A STRIKING INSTANCE OF COMMON IGNORANCE—NECESSITY OF FERTILE EGGS—INFERTILE EGGS THE CAUSE OF MUCH DISSATISFACTION WITH INCUBATORS—A GOOD HOME-MADE EGG-TESTER.

One of the many useful things required in the poultry business, whether conducted in a natural or artificial manner, is an egg-tester. It enables a person, before he has lost much time, to ascertain whether his eggs are good and fertile, and if not he can replace them with good ones at the end of five or six days. If his own eggs are infertile, the tester enables him to procure better from his neighbors.

I once knew a man, early in February, to set forty or fifty hens with a view to grow a lot of broilers for early market. When the hens came off, he found that there were but two or three fertile eggs under each hen. Now had he examined his eggs at the end of four or five days with a tester, he might have put the few fertile eggs under several hens and supplied the remainder with good eggs. He would have lost but little except in the first cost of his eggs. As it was, the best of the season had passed and he could not hope to receive large profits from his chicks.

I was called by a friend to see his incubator. He told me that he had put five hundred eggs in it and had hatched only one chick, and that died, and he wished me to ascertain the cause if I could. I found the eggs in the machine just as he had left them. I broke several hundred of them without finding the least sign of fertility in them. The yolk was intact and the white as clear apparently as when first laid. I told him that he had done very well, as he had hatched one hundred per cent of all the fertile eggs. At the same time I told him that any man who would de-

liberately run a machine three weeks on five hundred eggs without taking any pains to ascertain their quality, had better change his occupation, for he would never succeed in the poultry business.

There are quite a number of egg-testers in the market, some of which are not suitable for incubator use, as they require the egg to be adjusted in a certain position, making it a mere waste of time and heat. A good practical egg-tester for incubators can be made in fifteen minutes and will last a lifetime.

Take a common oblong box without a top, make a hole in the bottom about three inches in diameter, nearly opposite the blaze of your lantern when standing on the inner end of the box. or hanging on a peg (Fig. 5).

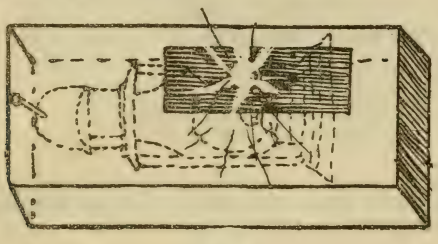


Fig. 5.

Nail over this hole a piece of an old rubber boot-leg, with a hole about the size of an egg. Put your lantern inside of that box some evening, and yourself on the outside, hang it up just over your egg-tray and you have the best thing out for a tester; you can easily trace the veins in the embryo chick, and the first signs of fertility as they appear.

CHAPTER X.

THE DEVELOPMENT OF THE CHICKS.

THE DIFFERENT STAGES OF INCUBATION—HOW RECOGNIZED—IN DUCKS AND HENS EGGS—THE PROCESS ILLUSTRATED—THE LIVING AND DEAD EMBRYO—ADVICE TO BEGINNERS.

A person about to enter the poultry business, should acquaint himself as soon as possible with the egg at different stages of incubation, as this knowledge will in many cases save him from disaster and loss. It is a sad mistake to wait till the three weeks are expired before one finds out whether his eggs are good for anything or not.

I have known men repeatedly to set hens at different times in the winter as they became broody, until they had as many as thirty or forty hens, covering as many dozen valuable eggs, and never find out that the eggs were worthless until the first lot was due, and they found no chicks, when a short examination of the eggs about the fifth or sixth day, would have saved the loss of both time and eggs.

The fertility in ducks and white-shelled hens eggs can be easily detected by an expert the third day after they are put in the incubator or under the hen; the quality of dark-shelled eggs from Asiatic fowl, so far as they are fertile, about the fourth or fifth day.

Fig. 2 represents an egg as it appears during the third day, through an egg-tester. The dark spot seen in the egg enlarges each day, becoming more opaque as incubation progresses, until the seventh day, when it covers the entire egg. In the meantime, about the fifth day, a dark spot will be seen near the centre of the egg, towards its upper surface, from which in a live embryo a few irregular veins can be distinctly perceived. As the egg is

held to the light this spot will float on the upper side of the egg, as it is turned. This is represented in Fig. 3, Page 22.

It is sometimes difficult in this stage to distinguish the live from the dead embryo. The latter will, on the sixth or seventh day, present a broken, clouded appearance, the contents usually revolving with the egg when it is turned; while the living embryo will usually rise to the upper side or top of the egg. The dead

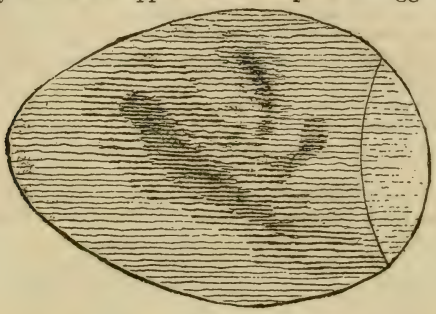


Fig. 6.

embryo at this stage is represented in Fig. 4. There are eggs that are slightly fertilized but without vitality enough to carry them through; they will sometimes become offensive and should be removed both from under hens and from the incubator.

In Fig. 6, I give the appearance of the living embryo as seen through the shell on the tenth and eleventh days. At this time,

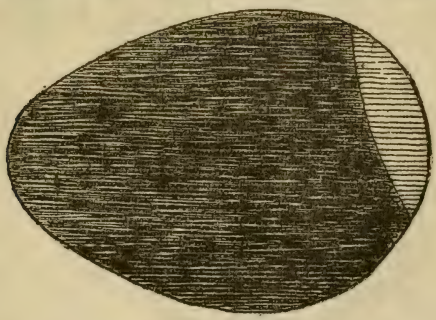


Fig. 7.

if the egg is held steadily to the light, motion can be plainly seen, as well as the trembling of the pulsating arteries. At this stage even a novice can easily detect a fertile from an infertile egg, and can soon learn to distinguish a dead from a living embryo.

From this stage onward, the contents of the egg grow darker, until the sixteenth or seventeenth days, when the egg

becomes entirely opaque, as represented in Fig. 7, except the air cell in the long end of the egg. This air cell, though it exists in every egg, is extremely small in a fresh laid one, and as incubation progresses gradually enlarges, through the evaporation of the white of the egg, until the sixteenth day, after which the chick begins to enlarge and the air cell grows correspondingly smaller, so that when the chick is ready to pip the cell is little more than one-half as large as it was three days previous.

It is not well for an amateur to test his eggs too soon or until he has had some experience in the business, as there is a vast difference (as seen in the egg-tester), between a white-shelled egg and a brown, a thick, or a thin-shelled egg. I have repeatedly known dark brown eggs at the end of three weeks to be entirely opaque, and yet when broken have the appearance of fresh laid eggs.

During the process of incubation say, at the eighth or ninth day, it is easy for anyone to distinguish between a fertile and an infertile egg, but not so easy to detect a dead embryo when seen through the shell. The best way is to mark all doubtful eggs and return them to the machine, examine them again at the thirteenth or fourteenth days, when if no change has taken place they can be safely removed from the machine.

Fig. 8 represents the appearance of the embryo at the twelfth day when taken from the shell, when it will kick vigorously. From this time the growth and development is rapid. After this point, the chick will bear far greater changes of heat and cold than at the earlier stages of incubation.

Fig. 8

At one time, through my own carelessness, I allowed the temperature to reach 114° for a short time on the eighteenth day of a hatch. There were four hundred fertile eggs in the machine. The next day both the inside and outside doors of the machine were left open. The glasses on the eggs registered 68°, and yet three hundred and seventy-one chicks were hatched from those eggs on the twenty-first day, or over ninety-two per cent. But anything like that variation during the first ten days would be fatal to every egg.

The eyes, beak, legs and feet of the embryo are gradually developed, but it is not till the nineteenth day that the yolk is completely absorbed and the chick ready to come out. He begins by making a faint peeping inside of the shell; then breaks the shell; then makes his way entirely around the shell, breaking it as he goes, and finally bursts open his shell and makes his appearance. A good healthy chick will do this himself without any assistance from the operator. Sometimes it is necessary or well to assist the chick in breaking the shell after it has got its head out.

CHAPTER XI.

THE CARE OF INCUBATORS.

IMPORTANCE OF THE SUBJECT—NEGLECT FATAL EVEN WITH "SELF-REGULATORS"—TESTING THE MACHINE—TEMPERATURE—A HOT ROOM NO PLACE FOR AN INCUBATOR—SPRINKLING—THE LAMP—TURNING EGGS—USE GOOD OIL—THE THERMOMETER.

This is one of the most important items in the whole business. Many manufacturers of incubators give such a glowing account of the self-regulating qualities of their machines that purchasers think that all they have to do is to fill the machine with eggs, light the lamps, and at the end of three weeks take out the chicks.

Now it is as well to understand here that no incubator ever has been or ever will be put before the public that will bear neglect, because there are certain duties which must be done periodically, such as turning the eggs, trimming and filling the lamps, looking after the machinery to see that there is no chafing or friction on the bearings, etc. It is well to run a machine for several days before introducing the eggs, for if you cannot run it without eggs you certainly cannot when full of hen fruit, and it is well to run no risks.

There are so many different patterns and styles of incubators, nearly all regulated in different ways, that it would be next to impossible to give instructions that would apply to all. There are, however, many points and generalities which are necessarily common to all machines, such as temperature, moisture, ventilation, uniformity and regularity of heat.

No machine should be put in a room where there is a great variation of temperature, as it will require regulating each time there is a great change; for the reason that the amount of heat required to run a machine in a room of 80° would not be sufficient to run the machine at a temperature of 40°, while the amount of heat required to run a machine in a temperature of 40° would necessitate an immense ventilation to keep the heat within limits inside the machine. Though this might be met by some machines, there is yet one difficulty that cannot be overcome. The increased ventilation carries off the moisture from the egg-chamber and that means a hardened egg shell, a tena-

cious inside membrane and the inevitable dead chick in the shell. A very warm place is unsuitable for running an incubator, as it requires far more care and judgment and would puzzle a novice.

I received a letter from a gentleman in Illinois a few days ago who is using a Monarch incubator. He was running the machine during the month of July, when the weather was excessively warm, in a building exposed to the heat. During the last three days of the hatch the animal heat of the eggs was so great that (there were twelve hundred fertile eggs in the machine) he was obliged to put out the lights entirely and then the heat in the egg-chamber went up repeatedly to 110° and 111°. Finally he was obliged to open both outside and inside doors of the machine, in order to reduce the heat.

Now this was all wrong; for though he reported a fair hatch, yet there were a great many pipped eggs with dead chicks in them. Had he sprinkled his eggs profusely with tepid water and shut the doors of his machine, the rapid evaporation would have cooled his eggs down to the required temperature, and at the same time generated all the moisture needed, and there would have been no dead chicks. Sprinkling about once in four hours would have met this case.

As a rule I do not encourage sprinkling, for reasons already mentioned in this work, but in this case it was the only way to secure a good hatch. During the past six weeks (June–August), I have had the same experience repeatedly in running large hatches of duck eggs. The animal heat in the eggs alone kept the machine at 106° to 108° with the lights all out, the excessive heat being kept down only by sprinkling the eggs.

Never use more flame on the lamps than is necessary, as too much heat is not only a waste of oil, but in most self-regulating machines means increased ventilation, which for reasons before mentioned is sure to impair the hatch.

In taking eggs out of the machine to turn them, they should be handled quickly and carefully. As the center of nearly all machines is usually the warmest, and the outside near the doors the coldest, it is well not only to change the drawers end for end in the machine, but to change the eggs from the ends of the trays to the center each day. Always place the thermometer on the eggs in the center of the drawer, as in most machines the heat is greatest in the center. Eggs should be turned twice each day.

In running machines regulated by electricity a constant supply of chemicals should be kept on hand. The solution in the battery must be kept strong, the metals thoroughly cleaned and the zinc removed often, as a weakened solution and consequent want of action in the battery, because of a little neglect, have often cost a whole hatch.

Always use the best of oil—160° test. Poor oils are not only unsafe, but unreliable, as they are sure to crust in a few hours, clog the extinguishers, and as crusted wicks give out little or no heat it necessitates trimming several times each day.

CHAPTER XII.

BROODERS, THEIR CONSTRUCTION AND USE.

HENS AS BROODERS—THE INCUBATOR A SUCCESS, BUT AN ARTIFICIAL MOTHER NEEDED—I MAKE A BROODER—ITS REMARKABLE SUCCESS—PLENTY OF HEAT AND NO VERMIN—THE MERITS OF VARIOUS BROODERS—IMPORTANCE OF GOOD ARTIFICIAL MOTHERS—OVERCROWDING—A CHEAP AND EASILY MADE BROODER.

It will be observed that during the first part of my experience with incubators, my greatest trouble was to get chicks enough from them to supply my broody hens. During the latter part the trouble was to get hens enough to care for the chicks.

When hens were laying well and there was a reasonable expectation of their soon becoming broody, machines were filled with eggs anticipating that event. But I was so often disappointed that I have sometimes been obliged to put forty to fifty chicks to each hen. Of course a sad mortality was sure to follow. The situation was becoming desperate and nearly as bad as at first. There was now no trouble in hatching. I could get out strong, healthy chicks in any desired quantity, but as I wished to get them out in winter, the question was, what to do with them.

In the autumn of '79, I began the construction of artificial brooders, anticipating the winter's hatch. These brooders were intended to accommodate about two hundred chicks. The heat was generated in copper boilers, flowed through an iron pipe and returned to the boiler through a galvanized iron tank. This tank was eleven inches wide and five and one-half feet long, and supplied the heat to the chicks. I proposed to try one carefully and satisfy myself as to its utility before using them on a larger scale.

In pursuance of this plan, I chose one of my chicken houses some seventy-five feet long for the purpose. In one end of this building I put eight hens, giving them, in addition to what chicks they hatched themselves, one hundred chicks from an incubator

started for the purpose. In the other end of this building I put a brooder with one hundred and fifty chicks taken from the same incubator. They all received the same care, except that the hens' department got a great deal the most because they needed it.

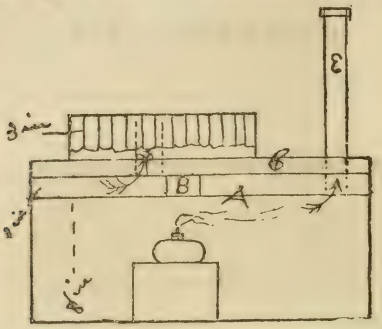


Fig. 9. A Good In-Door Brooder.

Those chicks were hatched January 21. On May 25 following, when four months and four days old, the chicks were sent to market.

Of the one hundred and fifty brooder chicks, one hundred and thirty-five were matured, a number had died in the brooder, one or two were drowned, and as brooder chicks are very tame and my understanding unusually well developed, as a natural consequence quite a number were trodden upon. The largest chicks in the brooder weighed six and one-half pounds. The aggregate weight was six hundred and thirty-nine pounds, and the price received, forty-five cents per pound live weight, amounting to $287.55

Of those chicks which were consigned to the hens, ninety-eight were left. Their aggregate weight was three hundred and ninety-two pounds, which brought $176.40. Not one of those hens' chicks weighed over four pounds. It is needless to state that the brooders were brought into requisition at once.

After April 1 the brooders were located out of doors in different parts of the yard. Hens were supplied with chicks and placed at a proper distance. All were properly cared for, as I was bound to see the experiment carried out through the entire season. In every case the advantage was with the brooders. Not only was the mortality less, but the chicks were larger and their condition better. And strange to say, where the hens were located near the brooders, before the chicks were ten days old, they would leave the hens and crowd into the brooder and some hens had not a chick left. They had found where there was plenty of heat and no vermin.

That season's experience perfectly satisfied me in regard to the utility of brooders. I have made no use of hens since, as all I require of them is to furnish me with eggs. I have each season grown from three thousand to four thousand chicks. These chicks have been grown principally in the winter and early spring months, in order to secure the highest market prices.

I am often asked the question, "Do you consider your brooder the best in the market? If not, which is the best?" Now this is a very delicate question for me to answer, and then it de-

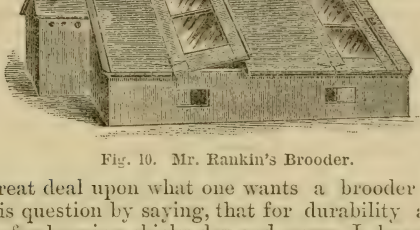


Fig. 10. Mr. Rankin's Brooder.

pends a great deal upon what one wants a brooder for. I will answer this question by saying, that for durability and for out-door work for keeping chicks dry and warm, I have never used anything I liked better; but for inside work brooders can be made for a great deal less expense that will do equally as good work.

There are a great many different kinds of brooders in the market, some of which do very good work, some require more care than others, some are altogether too high priced and elaborate in their construction to be of use to the practical poultry grower. Others are comparatively worthless, being regular death-traps to the chicks, while others still are evidently built by men who have little or no knowledge of the business and are of little practical use.

This question of good brooders is, next to incubators, the most important in the whole business. It is more than useless to hatch out strong healthy chicks in large numbers only to have them smothered in worthless brooders. The worst feature of this is that incubator men themselves not only injure the reputation of their own brooders, but those of others, by advertising them at more than double their actual capacity, thus ensuring a great mortality to start with. Innocent parties buy them and ignorantly fill them up according to instructions, when disaster is sure to follow through over-crowding and consequent over-heating.

Serious trouble often arises from over-heating brooders. Too much heat will surely cause diarrhœa. This trouble is often attributed to improper food, when a course of treatment is adopted which is of little avail so long as the cause is not removed.

I will describe a brooder (Fig. 9) in use in this vicinity, which I think is the cheapest and best extant for indoor use.

Take a box three feet square, without either top or bottom; the sides should be eight inches high. Nail on this box for a cover a piece of zinc (*A*) three feet square, which will cover it exactly. Nail on the top of this zinc, around the outside edges, strips of board one inch or three-fourths of an inch square, cutting a space (*B*) through in the center of each side three-fourths of an inch wide. Nail over these strips a tight half-inch board cover (*C*).

Now bore in the center of this cover a two-inch hole. Insert in this hole a two-inch zinc tube three inches long, indicated by the dotted lines. This tube should lead simply through the board cover into the air space between that and the zinc below. Run another pipe, smaller and longer, as shown at *E*, down through the air-chamber into the box, for the lamp smoke to pass up and away. Now take a piece of board two feet square and nail four legs to it which will raise it three inches high; then tack some woolen fringe around the sides of this board cover, slashing it up every two or three inches. This should stand on the platform so that the zinc tube will be exactly in the center and leave a little more than half an inch between the board cover and the top of the tube. This is the brooder for the chicks. All that is wanted now is a tin lamp with an American Diamond burner, set inside the box underneath the zinc. By this arrangement the air is drawn in through the holes left open at the sides between the zinc and the board cover, is heated by the lamps, and passes up through the zinc tube and radiates out all over the chicks, giving them a constant supply of pure, warm air.

I consider this the best brooder out for inside work; it will accommodate fifty chicks. A dollar and a half in money and three hours' labor will make it. An incline should be made for the chicks to run up. The superior ventilation of this brooder, the ease with which it can be cleaned, and its cheapness make it, for in-door work, superior to any other.

CHAPTER XIII.

THE CARE OF CHICKS.

THE FIRST MEAL—KIND OF FEED—GREEN FOOD ESSENTIAL—FREQUENCY OF MEALS—EXERCISE—SKIM-MILK—BUILDINGS FOR WINTER CHICKS—THEIR CONSTRUCTION AND DESIGN—HEATING—BROODERS VS. THE BOILER AND PIPES' SYSTEM—BEST TIME TO HATCH FOR EARLY BROILERS—AN EXPERIENCE IN POINT—WHEN TO SELL—HATCHING WINTER LAYERS—SYSTEM OF HATCHES.

The chicks should be fed for the first time about thirty-six hours after leaving the shell. The very best feed extant for that purpose is the infertile eggs boiled hard, chopped fine, and mixed with one part egg and three parts bread crumbs for the first three days. Chicks will always thrive on this feed. After three days, the feed may consist of three parts of Indian meal with one part scalded shorts.

This diet should be interspersed with green feed, such as grass, chopped onions, boiled potatoes, refuse cabbage, etc. Cracked corn and wheat may be added as they grow older—say when ten days old.

Feed four or five times a day, when your chicks are first out, and never give them more than they can eat clean. Give a little meat occasionally, and above all give the young things plenty of exercise; everything depends upon that. Dig away the snow in front of your poultry buildings if in winter. The chicks will not need much urging; simply give them the opportunity to go out when the sun shines. Always recollect that the most active members of the body, either in man or animals, are the first to suffer from disease, and that swollen feet, and weak and crippled limbs in young chicks:—though usually attributed to rheumatism—are simply caused by too highly concentrated food and too little exercise, thus causing a total want of action in the digestive organs, and the chicks literally starve in the midst of plenty.

Skim milk, either sweet or sour, is excellent for mixing the feed. It will give young chicks a vigor and a growth in cold weather when other things fail. Plenty of clean water should be kept by them and milk when obtainable.

Brooders and runs should be cleaned out thoroughly and often, and the whole premises kept well disinfected.

In constructing suitable buildings for growing winter chicks, convenience as well as economy should be taken into consideration. For as labor is nearly the most expensive essential in a poultry establishment, buildings should be gotten up with a view to economise that even if the original cost should be a little more. I am more and more satisfied that a walk three or four feet wide is a necessary adjunct to both poultry and chicken buildings of over thirty feet in length.

A good building for chicks in winter should be about fourteen feet wide, facing the south, with a four foot walk on the rear side. It should be divided off, into pens five feet wide, a brooder and fifty chicks in each. This would give a space five by ten feet to fifty chicks. There should be a yard of corresponding width in front for out-door exercise. This building can be extended to any desired length, and need not be more than two feet high in front, with, say, five feet posts in the rear. It can be put up with an unequal double roof, with a ten foot slope in front

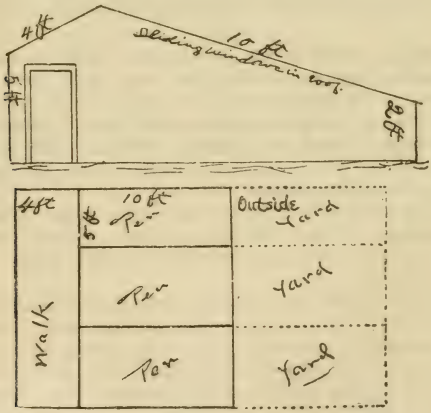


Fig. 11. A Winter House for Brooders.

and a four foot slope in the rear. The glass should be run from the eaves about six feet up the slope in front, and need not occupy more than one-half the longitudinal space on the roof. See Fig. 11.

Ventilation should lead from out the floor up through the peck, and will come up by the partition which separates the chicks from the walk. The sashes should be so adjusted as to slide and

give additional ventilation during extreme warm weather, and so arranged that they can be operated upon from the walk.

Opinion is about equally divided as to the best and most economical method of heating a chicken house. Many prefer to heat with hot-house boilers, running hot water through the whole length of the building, and utilizing the heat from the floor and return pipes as brooders for the chicks. There is no doubt but that this system will work well, but it is too expensive for a man with but little or no capital, as it will cost nearly as much as the whole building. Nor is the first cost the whole expense attending it; for if you have but fifty chicks, it necessitates heating the whole building, whereas by the system of separate brooders in each pen one cent's worth of oil will furnish heat for fifty chicks, so that your expense can be exactly proportioned to the number of chicks. Besides, a complement of brooders can be furnished at less than one-fourth the cost of boiler and pipes.

The best time to hatch chicks for broilers is in January and February; hold them until the first of June or until just before the price falls, getting all the weight on them you can. Good chicks well cared for should weigh at four months old ten pounds per pair. Chicks of that size will always sell much more readily than smaller ones, and at better prices, as the market is always full of the latter size.

I once got out some five hundred Brahma chicks in January. They throve wonderfully, and the May following, when a little more than four months old, weighed five pounds each. I tried to sell them to a prominent dealer in Boston, but when I told him their weight he was incredulous and said: "Early spring chicks don't weigh ten pounds per pair in this part of the country;" and offered me the going price for winter chicks. This did not suit me. I afterwards sold the chicks alive at the door for something more than $4 per pair. This same man bought some of them second handed, saying that they were the best chicks he ever saw of their age. They must have cost the consumer pretty high by the time they reached him.

It will readily be seen by this that the profits on one chick got out in January or February are more than the profits on five chicks got out in June or July. Indeed no one can afford to hatch chicks during the summer months, as the extreme heat will reduce the size and vitality of chicks far more than the cold of the early spring months. Then, as they are always sure to be off condition, the price is always low, compared to the more robust chicks got out earlier in the season.

Chicks hatched before the first of March should all be sold, both pullets and crowers, otherwise the pullets will lay in July and August and be in the fall the same as an old hen, and one can hardly afford to keep a $2 pullet idle through the winter and then sell her for less than half that sum in the spring.

The proper time to hatch out Asiatics for winter layers is in March and April, while the Leghorns and smaller breeds will do as well in April and May and even the first of June.

During the months of January and February one machine was run entirely on hens' eggs, and our buildings were filled with chicks all intended for market. During March the machines are run to their utmost capacity on ducks' eggs. During April, the incubators are run largely on hens' eggs, to furnish store fowl for winter laying. Then in May and June they are run entirely on ducks. As fast as the spring broilers go to market, the buildings are filled right up with young ducklings, and as ducks will be as heavy at eight weeks old as a chick at eighteen weeks, we can readily see that the one business does not necessarily interfere with the other.

CHAPTER XIV.

RAISING EARLY DUCKS FOR MARKET.

AN EXCEEDINGLY PROFITABLE BRANCH OF POULTRY RAISING BUT LITTLE KNOWN—DUCKS EASIER TO RAISE THAN CHICKS—TREATMENT—FEED—TIME OF MARKETING—PRICES AND PROFITS—QUALITY OF THE FLESH—STORE DUCKS—MANAGEMENT OF HATCHES.

Brooders are especially convenient in growing ducks, as the ducklings seldom need heat more than ten days.

The raising of ducks for market is a business which I supplement to my chicken business. I find it, if anything, more profitable than chicken raising, as the ducks can be hatched and grown artificially with far less care and trouble, and with much smaller percentage of loss, than when grown under hens.

I have got out the present summer some three thousand ducklings, and can truly say that from the first fifteen hundred, I lost but one duck.

These ducks simply require water to drink, and are fed nearly the same as chickens, except that they need rather more animal food as they increase in size. They should be carefully guarded from the rain for the first fortnight. They should also be yarded while young, for, if allowed free range, they greedily devour all manner of insects, which they do not stop to kill, and too often pay the penalty with their lives Boiled potatoes and vegetables should be fed freely at least once a day to young ducks, which should have four meals each day until five weeks old. Cracked corn and refuse wheat may be kept by them, but while fattening they should have all the soft food they can eat at least three times a day.

Ducks should be marketed at nine or ten weeks old, as soon after that the pin feathers begin to grow and they are off condition and soon become poor, while it is an immense job to pick them. If not marketed at the time above mentioned, they will not be in condition again till after they are four months old. Pekin ducks at nine weeks old, if well fed, will dress from eight

to eleven pounds per pair. I obtained for the first lot sold this season three dollars per pair. At present (June 15), the Boston dealers return two dollars per pair.

An idea may be formed of the profits connected with the business when a careful estimate places the cost of growing a duck at less than twenty-six cents per head up to nine weeks old. Ducks will stand close confinement far better than chicks, are voracious eaters, and are not particular as to the quality; and to my mind a pair of nicely roasted young ducks is excelled by nothing in the poultry or game line, and is a dish fit for any epicure.

Store ducks should be kept in a warm place and fed liberally to induce early laying. The incubator should be filled with these eggs as early in spring as may be, as the sooner the young ducklings are hatched the higher the prices obtained. Yet, unlike chicks, they are very profitable when hatched out as late as the first of August. I hatch most of my ducks in May and June, when the hatch of chicks is concluded and the machines would otherwise be idle. As fast as the spring broilers go to market, the buildings are filled right up with ducklings. Now as ducks will be as heavy at eight weeks as chicks at eighteen weeks, it will be readily seen that the one business does not necessarily interfere with the other.

Up to the present time of writing (June 15), I have some two thousand ducklings out. Quite a number of these ducklings have already been marketed, dressing from ten to eleven pounds per pair at nine weeks old. As these ducks bring thirty cents per pound at wholesale prices in Boston, and cost but five cents per pound to grow them, it is easy to see that it is a paying business. I do not lose more than one per cent of the ducklings when they are properly cared for, my hatches running from ninety to ninety-eight per cent of fertile eggs.

CHAPTER XV.

MARKETING POULTRY, BUILDINGS, SELECTION OF STOCK FOWL.

DRY-PICKING VS. SCALDING—PROPER DRESSING—CAREFUL PACKING FOR MARKET—KILLING AND PICKING—DRESSING DUCKS—BUILDINGS FOR POULTRY—PORTABLE HOUSES—THE LABOR QUESTION—VENTILATION—GENERAL DESIGN OF A PRACTICAL HOUSE—SELECTION OF STOCK FOWL—IN-AND-IN BREEDING—THE AUTHORS' METHOD.

MARKETING POULTRY.

This part of the business is a most important one, and when well managed adds greatly to the yearly receipts. A lot of fowl cleanly dressed and carefully packed will always command from eight to ten per cent more than fowl in equally as good condition but dressed in a slovenly manner, carelessly thrown into a box with pin feathers sticking out here and there, the skin torn, and sent to market in that condition.

Fowls for Boston market should always be dry picked, as scalded poultry will surely be cut from ten to twelve per cent. For the New York market, it is immaterial, as other things being the same, the price will not vary much between dry picked and the scalded. In either case the fowls should be carefully packed, breast down, and (if shipped any distance) with layers of clean straw between. Sometimes large-boned, loosely-built chicks that are in really good condition, will not show for what they are worth. In such a case the breast-bone may be broken down, just after dressing, with a soft mallet, giving them a plumper, better appearance, and making them better for purchaser and consumer.

Parties living at a distance from market will always find it for their interest to ship their poultry in a first-class condition. Poultry should always be graded and that poorer in quality shipped by itself. A few pair of fowls out of condition mixed with a lot of first-class poultry, will often shrink the whole lot

from two to three cents per pound, when the objectionable sold by themselves would perhaps shrink no more.

A person by a strict attention to details in dressing and shipping his poultry will soon establish a first-class reputation among the dealers, a thing which he can hardly afford to forfeit just for want of a few moments' extra care. The writer has marketed the present season, tons of poultry all of his own growing and entirely to retailers, thus saving one profit. It was a great gratification to him a day or two since to hear a prominent Boston firm say, "We never order poultry elsewhere as long as we can get it from you," and a member of another firm the same day said, "Your poultry commands two cents per pound more than that obtained elsewhere. We can get all the poultry we want at two cents less than we pay you, but prefer yours at the higher price." I always have more orders for my poultry and eggs than I can possibly fill. I do not mention these facts through any feeling of egotism, but simply to show that a great part of the profits arising from the poultry business are secured through the close attention to this part of the work.

The fowl should always be bled through the mouth. A clean cut with a sharp pointed knife across the roof of the mouth just below and under the eyes will do the business. A half-minute will be all-sufficient to bleed, and when the bird begins to struggle give it a smart blow on the back of the head and begin the picking at once. A smart picker will have the feathers nearly all off before the bird ceases to move. The ruling price in this vicinity is three cents per head for dressing chicks and five cents for ducks, and some pickers make from $3 to $5 per day at these prices. Ducks should be thrown into ice water as soon as picked, and kept there till marketed. They do not require to be drawn. The wing feathers from the outside joint, with the head, should be left on.

POULTRY BUILDINGS.

I am often asked to give a plan for practical poultry buildings. This is a very difficult thing to do because some people want their buildings very ornamental, while others, whose purses are lighter, want structures that are barely practical. Some have plenty of room, and can colonize their fowl out in small or portable buildings, and give them plenty of range; this, all things considered, is the best method.

Others still are limited for room and would like to know how many fowl they can keep to advantage on a given area. Now these different situations require differently constructed buildings.

Then again the labor question as connected with the poultry business, is one of the gravest import. It is now difficult to get faithful, intelligent help. The old impression that boys and girls and invalids are adapted to the care of poultry is fast wearing away. The poultry business means long days, early work and

late, and there is not only a large amount of drudgery connected with it, but it is a work of detail, as well as requiring constant vigilance and activity.

Hence, in all poultry establishments, got up with a view to profit, the buildings should be constructed with a view to simplifying the labor question and every facility allowed for cleaning and purifying. The sanitary department comes first on the list, for where poultry are reared on a large scale the predisposition to vermin and disease is in exact ratio to the number kept. Especially is this the case where the fowl are confined.

Ventilation should always be from below, as this carries away the cold air and foul gasses instead of the warm pure air of the upper stratum. A person has only to pass through a building occupied by fowls and ventilated in either of the above ways to satisfy himself of the utility of the bottom ventilation.

Where one is limited for space and large buildings are necessary, undoubtedly a double roof building twenty-four feet wide, with a four foot walk in the center, is the most convenient and best. This building need not be more than four feet high at the sides, and can be of any required length. There should be a pump connected with this aisle, and the fowl should all be fed and watered from it. This reduces the labor and care to a minimum.

By this arrangement an hour each morning and evening would be all the time required to feed and water one thousand fowls. Of course a building of this description one hundred feet long would be ample accommodations for five hundred fowl. Such a building need not cost over $275, but can be made to cost twice that sum. The fowl should have access to small dust rooms and the nests should be arranged so that the eggs can be gathered from the walk. The whole thing should be got up with a view to simplify the labor and sanitary departments, as constant cleanliness is absolutely necessary to success.

SELECTION OF STOCK FOWL.

It has always been a pet theory of mine that only the very choicest, either in the animal or vegetable kingdom should be reserved for the reproduction of its species. Especially is this the case with poultry, where deterioration is so great through natural causes.

Many experienced poultry-growers maintain that it is absolutely necessary to introduce foreign blood through a change of cockerels, at least every second year, and every year would be better. Others still assert that by a selection of the choicest birds, even by constant inbreeding, the flock may be improved. A series of careful experiments for the past ten years has convinced me that the latter opinion is correct.

Of course it will be understood that the frequent intermingling of blood will be in inverse ratio to the number of fowl kept. I carefully inspect every fowl of the thousands I raise, when kill-

ing, and whenever I find a promising cockerel or drake that has all the required points, and is unusually vigorous, he is thrown into a yard by himself. The points of merit must be: Short, yellow legs, standing wide, plump, heavy breast, clean cut head with a bright eye; and unusual vigor coupled with precocity. This latter removes the only objectionable point in the Brahma fowl, which I think, taken all in all, are the best for market purposes and also for the first winter as layers.

In the fall, I sometimes have from sixty to seventy-five cockerels carefully selected from many hundreds. These are again examined and the number I require, some thirty-five or forty, are taken out. Of the pullets and ducks, all objectionable birds are culled out and sold to the carts.

I inbred in this manner for six years in succession, and my fowls increased in size, vigor and in richness of plumage. My Brahma pullets at the end of the fourth year of the experiment, began laying at five months old, or as early as the Plymouth Rocks, so that with me inbreeding has been a decided success.

A word here in regard to the profits of the poultry business: A well managed poultry establishment should pay one hundred per cent yearly on all the capital invested.

CHAPTER XVI.

THE DISEASES OF POULTRY.

PREVENTION BETTER THAN CURE—DISINFECTANTS—EXTREME CLEANLINESS—SYMPTOMS OF DISEASE—CONTAGION—USE OF DOUGLAS' MIXTURE—ROUP—DIARRHŒA—CRAMP—BUMBLE-FOOT—SCALY-LEGS—GAPES—FEATHER-EATING—FOWL CHOLERA—LICE.

It is well for the amateur poulterer, who contemplates business on a large scale, to know at the outset that the predisposition to vermin and disease among poultry is in exact ratio to the number of fowl kept; and that nine out of ten of the diseases to which poultry are subject are the direct result of neglect and filth, and can be easily avoided by the use of disinfectants coupled with extreme cleanliness and care.

It is far easier to anticipate diseases in poultry than to cure. The careful expert can easily detect the symptoms as they appear. The discolored excrements, dull and ruffled plumage, apparent lassitude, want of appetite, pale comb and wattles, dull and lusterless eye, are to the expert sure premonition of what is to come.

The utmost vigilance is required and a constant supervision of the different flocks. All sick and ailing fowl should at once be removed, as many of the diseases to which fowl are subject are of the most contagious nature. During the winter months, and when fowl are confined, the Douglas' mixture should be given them in their drink at least twice a week. This mixture consists of half a pound of copperas and half an ounce of sulphuric acid to one gallon of water. One tablespoonful of this solution or mixture is enough to one gallon of drinking water. This mixture has a wonderful effect on the general health of the fowl, when properly and regularly administered, and is besides a good disinfectant.

ROUP.

This is a disease very prevalent among fowl, and in its incipient stages sometimes makes its appearance in the form of a

cold or slight catarrh. These troubles, if taken in time, are easily removed, but, if neglected, often result in serious loss.

When fowl are confined in damp, filthy quarters, or when cold drafts of air come in contact with the fowl, or when they are kept in poorly ventilated buildings, roup is a frequent visitor.

As this disease is very contagious, and often fatal, the affected fowl should be removed at once and placed in dry, warm quarters. The dried mucous should be removed from the nostrils; the passage to the roof of the mouth thoroughly cleaned; the head and throat bathed in kerosene twice each day. The bird should be fed on stimulating and highly nutritious food. In the latter stages of the disease, the discharges from the nostrils become very offensive, the head begins to swell, and sometimes one eye and occasionally both are closed.

All this can usually be prevented if the birds are taken in time, but when in this condition must be fed by hand, with soft food mixed thin with milk and a little red pepper dusted in. Unless a fowl is very valuable the axe is the best remedy.

DIARRHŒA.

Dust a little powdered chalk and cayenne pepper into boiled milk, feed on soft food, and withhold vegetables for a few days.

CRAMP.

This trouble, though usually attributed to damp quarters, is, I think, mainly the result of too highly concentrated food, coupled with too little exercise. Who ever saw chicks troubled with cramp when allowed to run out of doors, even in warm rain and dew, so long as they had plenty of grass and insects for dessert and plenty of exercise to stimulate action in their digestive organs?

On the contrary I was once called to a case where a man had just lost two hundred fine chicks from this trouble, and three hundred more a little younger were just coming down with it, and this in a building the floor of which was made of dry boards on which had been spread an inch of dry sand. A uniform temperature of 70° had been preserved in the room night and day. These chicks had been carefully shielded from dampness. This was in March.

I told him to clear away the snow from his building in front, turn his chicks out when pleasant, give them plenty of boiled potatoes, chopped cabbage, feed on bread crumbs and baker's dust mixed with sour milk with a little animal food, and report the result to me. At the end of a fortnight a letter from him reported two of the cases dead and the rest as lively as crickets, every symptom of the disease having disappeared.

BUMBLE-FOOT.

This trouble usually confines itself to the Asiatics and heavier breeds. When it first appears, the bird should be removed to

dry quarters with clean straw. The skin over the inflamed part should be shaved away a little, and caustic applied, which will nearly reduce the swelling. If that fails and the swelling becomes large, soft, and full of pus, it should be opened, the pus removed and the wound thoroughly washed out with warm water, when it will usually heal.

SCALY LEGS.

This is also confined to the Asiatic breeds and is easily cured. It is caused by a little parasite working itself into the interstices between the scales on the legs. Carefully apply kerosene to the affected parts, wipe off and rub in sulphur ointment. One application will usually be enough.

GAPES.

This disease is caused by small worms or maggots accumulating in the throat of the chick, and the disease is usually a denizen of damp, filthy quarters. The first thing is to thoroughly clean and disinfect the buildings and yards. Put the affected chicks into barrels and circulate dry air-slaked lime freely among them. Inhaling this will cause them to cough and throw up the worms.

FEATHER-EATING.

This is, I think, more an idle, vicious habit than a disease, superinduced by idleness and close confinement, or possibly a craving for animal food. Separate the offending bird, or the feather-eating will become general.

CHOLERA.

This is a terrible scourge—the worst with which the poultry-grower has to contend. It not only decimates but often destroys whole flocks. It is far more prevalent in the West and South than in the East and North. There is no doubt but that low, marshy grounds, and damp, filthy quarters will encourage the disease and predispose fowl to its ravages. In careful experiments by Prof. Pasteur of the London international medical college, it was found that the blood, body and excrements of the diseased fowl were filled with minute organisms. One drop of this blood introduced into a little chicken soup will speedily affect it in the same manner, and so on even to the hundredth departure, and one drop of that last dilution is equally as deadly as the original drop of blood from the diseased fowl.

The disease first makes its appearance in the urates, giving them a yellowish cast. These discharges, as the disease advances, gradually become more frequent and copious, and the bird becomes weaker, sometimes living several days, and often dying in twenty-four hours. Fowl cholera is not only the most fatal, but the most contagious of all poultry diseases.

Now as every part of these excrements are filled with the microscopic life of the cholera, it will be seen how necessary it is

to thoroughly clean and disinfect the building and confine the affected fowl by themselves.

In an experiment some time since a number of diseased fowl were confined by themselves, and fed on soft food into which was mixed a small quantity of medicine composed of equal parts of assafœtida, hypophosphate of soda and saffron, ground together, a little cayenne pepper being sprinkled in the food also. The drinking water was treated with the Douglas' mixture. Three-fourths of the fowl thus treated recovered. In another lot, simply confined and fed without any treatment, the disease proved fatal in every case.

The great point is to avoid contagion. Deodorize everything in connection with the buildings and have all infected matter burned. This alone will destroy the minute organism of fowl cholera.

LICE.

This pest is a great trouble to the poultry grower, and needs incessant vigilance on his part. There are two kinds of lice with which he has to contend.

The larger or body lice finds its home among the feathers of the fowl. She will usually rid herself of them when provided with a proper dust bath.

The smaller parasite, or the little red mite, is the most troublesome. When once they have obtained possession the only remedy is to fumigate thoroughly with burning brimstone. No living thing can withstand that. Then white-wash the whole inside of the building.

As in everything else, so here, a little prevention is worth a great deal of cure. These little mites originate on the perches, and are never on the fowls' body except to feed. Judging from sad experience, they have astonishing facilities for the reproduction of their species. The power of becoming great-grandfathers within twenty-four hours makes lively work for the poulterer as well as the old hen.

It is easy to avoid the red mites when you know how. Procure for perches planed spruce joists, two by three inches in size, and as long as required. Cover them with hot coal tar, and you will have no lice for at least one year. I have perches that were so painted three years ago; they have been in constant use ever since, and there has been neither tar or lice on them since. Every one knows that this tar is an oderiferous compound. It is excessively obnoxious to the lice. They will thrive and multiply daily in all manner of filth and offensive matter, but coal tar is beyond them. It costs a cent and a half per gallon. Every breeder of fowl should have a barrel of it on hand. This tar, before it is applied, should be boiled, and then a thin coat applied. It will then harden when it cools and will not tarnish the fowl.

PART SECOND.

THE PROS AND CONS OF

ARTIFICIAL POULTRY-RAISING.

HOME-MADE INCUBATORS AND BROODERS.

BY THE EDITOR.

CHAPTER XVII.

AGRICULTURAL EDITOR VISITS MR. RANKIN—HIS METHODS D BUILDINGS—PROFITS OF ARTIFICIAL INCUBATION—ARTIFIAL VS. NATURAL HATCHING IMPARTIALLY CONSIDERED.

A visit to Mr. Rankin's farm is especially interesting at this time, May 1. He is running four incubators, mostly on duck eggs. The day we were there a splendid hatch came out—three hundred and sixty-four ducklings out of three hundred and seventy-eight fertile eggs. Duck eggs generate more animal heat than hens' eggs and require more frequent spraying with water to cool them. This adds to the moisture also, which is a great essential in artificial hatching. Ducks grow much faster than chicks and if well fed will weigh ten pounds per pair at seven weeks old. Exclusive of the eggs, their cost at that age need not exceed twenty cents each for feed, and the average net profit is a clean dollar apiece.

Mr. Rankin uses Pekin ducks, but is to try the Aylesbury breed that is so popular in the London market. The Aylesbury is more fully breasted and makes a better appearance in market. There

is a rapidly increasing demand for ducks, since people are discovering that roast duck is better than the most delicate chicken. Ducks sold all last year at one to two cents per pound above the price of chicks, starting at fifty cents per pound for early ducks and running down to eighteen cents as the season waned. It is also to be remembered that ducks are sold "green," that is, they are not drawn but merely bled, whereas chicks are sold on dressed weight. The young ducks will lay on flesh faster and do better every way if not allowed to see water at all. Curiously enough, hawks won't touch ducklings, though hawks are a serious pest to the chicken yard.

The ducklings are fed on shorts, meal, scalded meat scraps, butter-milk, skimmed milk, etc. They require much more food than chicks, especially more animal food. A Cayuga drake crossed upon Pekin ducks produces a desirable market bird. Mr. Rankin is raising ducks for market extensively, having about eight hundred hatched already and three incubators full (four hundred eggs each) yet to come. It is more profitable to hatch the ducks for market than to sell the eggs for $1.50 per dozen, at least in the early part of the season. A flock of ducks are kept over to lay eggs another year. It is found that if these old ducks are confined and well fed their eggs are very much larger than if allowed full range in the swamp.

While the old birds will take care of themselves largely if allowed to range, it is a fact that the ducklings are much hardier and more easy to raise than chicks. In fact, Mr. Rankin does not lose one per cent of the ducks hatched. This is another strong point in favor of ducks. Like chicks they do better when colonized in small houses or brooders than where kept in large flocks.

Persons wishing to start in the business of raising ducks can do so to the best advantage and the least expense by setting the eggs in summer when they are cheap, and raise the ducks for an egg supply the next season. As with chicks, the earlier the hatch in spring, provided they do well and thrive (which depends on intelligent care), the greater the profit. Herein is the profitableness of artificial hatching, which enables one to get birds to market at almost any season and in larger numbers than would be possible by the natural method.

MR. RANKIN'S BUILDINGS

are the common nine feet wide house, six feet high in front and four and one-half feet in the rear, though the pitch of the roof need not be over fourteen inches. The Standard Roofing advertised by A. F. Swan, 46 Cortlandt street, New York, is used. The cost of these houses is $1.25 to $1.50 per running foot. They are better than more expensive houses. The roosts are along the back-side, with a wide board beneath catching the droppings. Underneath this board are the nests, which the hens enter from the rear. They are closed in front so that the hen lays in

darkness and is not liable to acquire the bad egg-eating habit. The front of the nests has a hinged door through which the eggs can be gathered. Wire netting bought for one cent per square foot from Peter Duryee & Co., 215 Greenwich street, N. Y., is considered the best and cheapest fencing, as well as the most convenient.

AS TO THE FEED.

The poultry raisers of all this section feed skim-milk and butter-milk largely. They buy at C. Brigham & Co.'s creamery in Boston, paying three and four cents per gallon. The cost of freight is only twenty-six cents per barrel additional, the railroad carrying in the empty barrel and returning it filled for this sum.

Charles O. Tribou, of Brockton, formerly worked in the shoe shops there and made good wages, but commenced in the poultry business in a small way two or three years ago with such success that this year he attends to nothing else. His incubator hatched seventy-five to ninety per cent of the fertile eggs, and he has already over twelve hundred chicks with as many more to come. He has tried making a house entirely of Standard three-ply roofing, but so much studding has to be used that he has decided it would be about as cheap to construct entirely of boards, using the roofing only on the roof.

MORE MONEY IS PROBABLY MADE

in the hen business—eggs and fowl for market, not for sale to breeders at fancy prices—by Mr. E. Damon than by any other man in New England—on an equal number of hens. He averages to keep eight hundred to one thousand hens per year on about eight acres, the profit averaging $1.50 from each above every item of expense. He has done this for ten or twelve years. He runs two incubators and had twenty-five hundred chicks out when we were there, and hadn't but just commenced. He employs one man and runs the hens in connection with a cider and vinegar business and other work. He says two men devoting their time wholly to poultry can care for four thousand fowls. Mr. Damon's principal fowl house is 12x36 feet. Two winters ago he kept two hundred and twenty-five hens in a house 26x80 feet and got an average of one hundred and eight dozen eggs per week for eight weeks without permitting the hens to step outside the house. One day the two hundred and twenty-five hens laid two hundred and five eggs. This is an unparalleled record. He feeds a great deal of shorts, cracked corn, wheat, etc., mixed with skim-milk and pigs' liver cooked and given warm.

A cross of three-fourths Plymouth Rocks and one-fourth Light Brahma is his favorite strain for both eggs and market poultry. A Light Brahma and Leghorn cross produces great layers. Last year he caponized one hundred and fifty cockerels but it didn't pay for the bother. A good deal of theoretical writing is printed about capons, but Mr. Damon does not believe there is any practical profit or advantage in them.

The chicks are removed from the incubator, when well dried

off, to the "chicken factory," a house 25x50 feet with six feet posts and four windows on each side. In cold weather this is heated by a stove. Pens on each side contain brooders of Mr. Rankin's pattern—a boiler in the bottom heated by a lamp at the end. The boiler is covered with dry sand, upon which the chicks huddle. This gives better satisfaction than to have the heat above by arranging a boiler to have chicks run under it. The building is well ventilated.

Mr. Damon is a firm believer in the improved incubator. He would use it for raising fancy breeding stock. He is confident artificially reared fowl have as much constitution and do as well, if not better, in every way, than those naturally raised. He showed us a flock of eighty fowl, procured of Mr. Rankin last fall, that have averaged sixty eggs per day all winter. Not a single hen has died or been indisposed, but they are all bright, thrifty and healthy, and will weigh eight to ten pounds. Not only were they hatched in incubators and never knew the loving care of an old biddy, but their parents, grandparents and four or five generations preceeding them had known none but artificial care.

Charles Alford is also very successful in artificial raising of poultry, so much so that an offer of $1000 a year and perquisites to run an artificial poultry raising establishment for another party wasn't any inducement. He allows his chicks to run out doors till cold weather, never has the roup or other hen troubles in his flock, and raises such stock that his eggs are in great demand.

ARTIFICIAL VS. NATURAL HATCHING.

A thorough and unprejudiced investigation shows that the artificial method of hatching possesses the great advantage of producing chicks free from vermin, and therefore to all appearances strong and healthy. With an incubator that will hatch seventy-five per cent and upwards of fertile eggs, far more chicks can be produced in much less time and less expense than by the natural way. It is not as much work to care for one hundred chicks hatched by an incubator and all kept in one brooder as it is to care for an equal number in charge of hens. Give the former as much room and care as the latter and they will do as well. The great trouble of many who go into the artificial way of raising poultry is that they crowd the chicks too much, often giving one hundred no more room than an old hen and her little flock are allowed. While experienced, practical men have demonstrated that chicks can be successfully raised in small quarters, it is worse than useless for the novice to undertake it.

The laying qualities of the artificially raised fowl will compare favorably with those raised by the natural method. Mr. Rankin has for many years surpassed his neighbors in egg production. Mr. Damon's flock, above referred to, which has been one of the most productive on record, was not only raised artifi-

cially, but its ancestors for half a dozen generations had been hatched in incubators and reared in brooders. Certainly no stronger test could be made of constitution and strength so far as egg production and thrift of the fowl is concerned, for a healthier looking flock is seldom seen. We wish also to record the fact that not a single ailing chick was noticed among the four thousand or more artificially hatched chickens seen on the trip, notwithstanding a rain storm, had preceded our visit. It should also be stated that our visit was totally unexpected where most of these chicks were seen, so that the owners had no opportunity to hide any diseased chicks had there been any cause or inclination for so doing.

The chicks hatched by hens at Mr. Damon's were in no wise superior to those hatched in incubators; if anything the comparison was in favor of the latter, though as they were of different ages we could not accurately compare them. The only point on which there appears to be any doubt is whether thoroughbred fowl artificially raised will possess the perfection of markings and the strength of constitution to transmit those markings equal to the naturally raised bird. This is a fine point of interest to breeders of fancy poultry only. For all practical purposes the experience of the gentlemen mentioned above and of others in their vicinity presents strong arguments in favor of artificial incubation. While the great majority of hatching machines are at present very defective. it is evident that great progress has been made when seventy-five to ninety-eight per cent of fertile eggs are hatched. We are convinced that despite the well founded prejudice against it, artificial incubation is in its infancy and that the time will come when reliable hatching machines will be used by every poulterer and sold at prices within the reach of all.

CHAPTER XVIII.

PRO AND CON—MR. HAWKINS' OPINION—NATURAL VS. ARTIFICIALLY INCUBATED CHICKS.

We have given our own opinion of natural versus artificial incubation in the preceeding chapter. It is needless to remark that the many failures in artificial incubation have created a prejudice against the system which later success is slow to counteract. Even Mr. A. C. Hawkins, the well known breeder, has expressed this opinion of incubators, in an address before the Massachusetts state board of agriculture in December, 1884:

"Now a word in regard to the use of artificial incubators by the farmer. Some of you, perhaps, may have used them, and, as you think, successfully. I have tried them for several years, having used all the best machines, and I would not take the best one that is manufactured to-day as a present, if I was obliged to use it myself. Chickens hatched by the hen are much stronger, larger, and finer in plumage; there is as much difference between artificially produced chickens and natural ones as there is between Jersey butter and oleomargarine. Nature does her work perfectly when she has proper opportunity. Many will ask how they are going to hatch chickens by the thousand? Just as I have told you how to hatch them by hundreds. You must keep more fowl and there will be abundance of sitters at the proper season. I have probably hatched and raised more chickens during the last six years than any other breeder, and the incubator has hindered more than it has aided me. I have had hatched on my place, in one week, over fifteen hundred chickens, all with hens. That is fast enough. I have probably spent more than two thousand dollars trying to convince myself that artificial chicken production was a benefit to me, but after the long struggle I haven't an incubator on my place; still the chickens hatch and grow."

This brought out a discussion on the question in THE NEW ENGLAND HOMESTEAD in which Mr. Hawkins was asked to explain how the manner of hatching a chick, (either naturally or artificially), is to influence the plumage. He thus replied:

"Any person who will give this question careful thought can plainly understand why the conditions through which a chicken passes before hatching should have as much or even more influence on its appearance at maturity than the condition which it

undergoes after incubation. Any practical poultry breeder, who has tried to hatch and raise chickens artificially, knows that they mature smaller and that the plumage has not the perfection of markings as do those hatched and reared by hens, the eggs being from the same flock under the same conditions. Knowing the result which is sure to come, let us look for the cause.

"Manufacturers of incubators claim they imitate nature perfectly in the construction of their various machines. The question is, Do they? I have had on my place and tested carefully one of the best incubators manufactured. To overcome the dryness of the heat in the machine, they place pans filled with water upon hot pipes beneath the egg drawers. There is a constant steam rising from these pans of water upon the eggs above. I will ask anyone if these eggs are receiving the same amount of moisture or the same kind of moisture that they receive when nature is doing the work, or in other words, when a hen is sitting upon a nest of eggs under a bush or shed? Is the heat administered to those eggs the same as that coming from the hen? Do the manufacturers know that the heat and moisture is right? No. In proof of this, when the chicks began to hatch on the twentieth day, a large part of them would pip the shell, and the inner membrane of the shell would quickly dry, and the chick from its weakness caused by three weeks of unnatural life did not have the strength to break out from the shell but died in the attempt. Others that were incased in weaker shells, or that had been less affected by improper moisture or heat, or had been in a location where the ventilation was more perfect, would hatch out—some to die young, some to come to maturity in an imperfect state in size, form or plumage.

"I have placed five hundred eggs in this incubator and five hundred under hens at the same time, and when they hatched all were placed with hens and given the same food and care. I raised ninety-five per cent of those hatched by hens and lost ninety per cent of those from the incubator, from no other reason than that the former were subjected to nature's heat, moisture and ventilation during incubation, and the latter were the product of an imperfect art. If the organs of the body are nurtured by these imperfect conditions during their growth, they cannot and will not perform the functions for which they were intended in a perfect manner. As the flesh and plumage of the fowl are products from the blood, if the organs of circulation and digestion are imperfect, so will the plumage be affected by unnatural conditions during incubation."

The side of the incubators was vigorously supported by the successful experience of others. One correspondent had had especially good success with the very machine Mr. Hawkins particularly condemned. A. F. Williams, a Connecticut breeder, wrote:

"In my own mind it is a settled fact that artificial hatching can be done with more success than with hens. I last season

placed some five hundred eggs under hens and in an incubator. They were as near alike as possible under all circumstances. The hens hatched sixty per cent and the incubator seventy-five per cent of the eggs. The temperature under a hen must vary more than in an incubator, but I think good ventilation is very necessary in the latter—not in direct contact with the eggs, but so they will have the benefit of the air. Eggs want airing every day. This is more necessary during the second and third week; at first they do not require it so much. Fifteen minutes to half an hour's ventilation is sufficient according to the weather. Do not let the temperature get below 70°

Another thing: Which is the cheaper way and the least worry,—to spend fifteen minutes tending an incubator, or go once an hour to see whether your eight or ten hens are on the nest or have concluded to retire from the incubating business? Or perhaps they think that in order to get up the necessary degree of heat it will require at least two or three hens on a nest. Or perhaps they think they need a little egg omelet or scrambled egg, and jump on the eggs. If they can't accomplish it that way they stick their toe-nails into and through the shells, and behold they find it so much to their idea that the whole flock gather round and partake of the feast. Then if the hens sit well and begin to hatch, just at this time they feel their need of fresh meat, and commence on the poor chicks, which fall victims as fast as they hatch. "Choose ye this day whom ye will serve," the incubator or the hen.

I have not said anything about the expense of feed for these same eight or ten hens for three weeks. Look at W. C. Baker of New Jersey, who keeps White Leghorns and Hamburgs and hatches some twenty-five thousand chicks a year artificially, and others who hatch their thousands of chicks.

I have had chicks larger at ten days in a brooder than at three weeks old with a hen. The idea is, that chicks can run in and get brooded when they want to; they will learn this very quickly and are not dependent on the old hens' notions. Then perhaps they get fed oftener in the brooder, which makes them grow faster. If you do not believe this, just try feeding them a little once an hour, keep in a warm place with a brooder, give some dry sand to scratch in, and you can fairly see them grow."

We have given space thus liberally to this point, because of the popular ignorance and prejudice respecting it. The American Poultry Yard, of June 27, 1885 treats the subject in a way worthy of insertion here:

"The past season has marked a great advance in artificial hatching. A great many lessons have been learned which will be of value for next year's practical work. The question is not as to the possibility of artificial hatching—that was long ago settled. Proprietors of immense establishments for the production of poultry have availed themselves of other means than the

hen-mothers to such an extent as to demonstrate the practicability of thus producing chickens. But there is a great question still unsettled in the minds of many breeders who do only a moderate amount of business, hatching say a few hundred chicks each season. Doubtless every such man has asked himself many a time: "Can I obtain a machine of proper size for doing my work, which I can afford to buy; which will give me nearly or quite as good returns as I would receive from eggs set under hens; one not too complicated in its construction or too delicate in its management?" And when the question is asked of us we do not hesitate to answer in the affirmative. There are just such machines made; they are advertised in our columns. If you propose to buy, select the machine as you would any other merchandise—by personal inspection where it is possible, receiving from the maker full instructions and explanations as to its peculiarities and treatment. Where this is not possible, order the incubator from a maker of good repute, and expect to serve a term of apprenticeship before setting up as a finished master of the art of artificial hatching.

Right here is where most of the trouble comes. Common sense should teach any man that unless a machine is a perfect automaton, its use must be learned before the best results can be secured. Yet, judging from the complaints from time to time put forth, not a few breeders who have never seen an incubator order one, fill it with eggs as soon as it can be set up, and if the first batch is in any way a failure a storm of wrath bursts upon the devoted head of the maker, and the hatcher is offered for sale at a great sacrifice.

Really, now, isn't this about the long and short of the whole matter? Half the people who write letters to the poultry journals decrying incubators, talk as though the machine ought to be an exception to all the rules of human experience. Such persons, springing upon a bicycle for the first time, would expect to ride with the most skillful, and only discover their mistake after a few tumbles in the dirt. Experience may be costly sometimes, but it must be had, and its teachings are always the most valuable. This is the way it happened to one of our friends the present season: He bought a well-known hatcher, filled it with eggs bought from the best breeders at heroic prices, and waited the result. For a time all seemed to go well, and the exact number of chickens he was *sure* of hatching was freely proclaimed among his friends. In an evil hour the regulator failed to work, and the heat went away up towards the boiling point. But our friend went to work, with less enthusiasm, it is true, refilled the incubator with less expensive eggs, kept his wits about him, demonstrated the reliability of the machine when properly managed, and would not now be without one. The man who is willing to learn to manage one will succeed with any of the standard makes. The man who is not willing to do so had better stick to the old hen of thirteen-egg capacity.

Another Massachusetts poulterer writes regarding his experience with a machine, that Mr. Hawkins condemned:

"Three years ago this spring I furnished a man in Hudson with three hundred and sixty eggs, the capacity of the incubator, and paid him $10 to run it for me. The result was three hundred good strong chicks. I brought them nine miles in a wagon to my home. And at night placed them under hens that I had ready, which had been sitting a short time. The next day I put them in coops, twenty-five chicks to a hen. They grew fast and were as smart as any I ever had hatched by hens. Out of the three hundred chicks ninety-five per cent lived, and were as strong, finely marked cockerels and pullets as I ever raised. This was the Perfect Hatcher, an incubator that Mr. Hawkins had tried and condemned. I have bred one variety of poultry for thirteen years, and my experience has been that if a flock of hens have an unlimited range and good young cockerels to run with them and the eggs are not over one week old when used, they will hatch just as well in a good incubator as under a hen. I have engaged parties to hatch for me this spring, although with a different machine of a capacity of five hundred and eighty eggs. I feel confident of a good hatch and shall have no trouble with sitting hens and broken eggs."—[F. A. Houghton, Worcester County, Mass.

CHAPTER XIX.

MR. RANKIN'S EARLY EXPERIENCE.

AS WRITTEN FOR THE NEW ENGLAND HOMESTEAD, AND FOR FARM AND HOME—A PROFIT OF SEVEN DOLLARS PER HEN—EXTRAVAGANT FACTS BACKED UP BY EXPERIENCE—SUPERIORITY OF THE ARTIFICIAL OVER THE NATURAL METHOD OF GROWING POULTRY—THE SYSTEM IN CONNECTION WITH OTHER FARM WORK.

In August, 1883, Mr. Rankin wrote a long article for THE NEW ENGLAND HOMESTEAD and for FARM AND HOME, in which he briefly narrated his experience with incubators. This article attracted instant and widespread attention, and was copied into almost every agricultural and poultry journal in the country. We print it here as a matter of important interest.

I have been engaged in the poultry business from my youth, and have ever found it the most profitable branch of farming. Much more profitable than ever before has it been since I commenced hatching and growing poultry artificially.

I have endeavored as near as possible to reduce the thing to a system. I never keep a hen after she is a year old, for the reason that biddy never lays as many eggs the second year as she does the first. Besides an old hen invariably molts in the fall, and does not recover plumage in time to furnish eggs to meet the high prices, or get out chicks for early spring broilers.

My main object has ever been to make eggs and get out chicks to meet the highest prices in the market. In order to do this, a stock of early pullets are absolutely necessary to furnish eggs at the right time. During the last winter and spring I have hatched out some three hundred chicks. A large proportion of them were sold during the months of May and June at prices varying from $1 to $2.50 each, one lot of one hundred and fifty selling at forty-five cents per pound live weight at the door.

I will give an item of my experience, during the past winter,

and the reader can judge for himself of the profits of growing poultry artificially.

I took from one of my small incubators, one hundred and thirty chicks and put them in a brooder and cared for them through the winter. When four months old, May 25th, those chicks sold for enough to cover the cost of growing them and the original cost of both incubator and brooder, leaving a clear profit of more than $100 besides. Of course the incubator and brooder were put right to work doing the same thing over again a second, third, and fourth time during the same season. I will now give you a copy of my balance sheet for 1881 and 1882:

Stock on hand Sept. 1, 1881:

138 pullets at $1.25 each,	$172.50	
Supplies and food of all kinds,	337.83	
35 gallons kerosene oil at eight cents,	2.80	
		$ 513.13

Stock on hand Sept. 1, 1882.

314 pullets at 1.25 each,	392.50	
813½ dozen eggs sold,	274.55	
137 fowls sold,	136.23	
571 chicks sold,	631.24	
		1444.52
Balance (net.)		931.39

This balance on the right side of $931.39, is a net profit of nearly $7 on each pullet with which the year commenced. Of course everyone knows that this is a showing which would be simply impossible without artificial incubation.

I have not given these items to air my own theory and practice, but to demonstrate the superiority of the artificial over the natural method of growing poultry. The one can no more compete with the other than can hand work compete with that of machinery in our large manufacturing establishments. It enables persons of limited means and narrow quarters to do a much larger business than by the old method. He can grow two crops on the same ground in one season, for the high priced spring chicks are out of the way in time to occupy the buildings and grounds with store fowl for winter layers. There is not the least doubt but that within a very few years every farmer or grower of poultry will have his incubator and brooder, and get out his chicks when they will make him the best returns.

My chicken buildings are from sixty to seventy-five feet long, fronting the south. They are nine feet wide, with a slightly inclined shed roof covered with tin. There is a window in front, for every eight feet longitudinally. These windows all have close shutters to prevent extreme cold during the nights in winter. The brooders are kept in these buildings during the winter months, and the young chicks are put in when hatched and dried off.

The chicks are fed for the first forty-eight hours on hard-boiled eggs chopped fine. After that they are fed on dough

made of three parts of Indian meal and one part of wheat middlings, and largely with cracked corn and wheat as they grow older. The young chicks are kept clean and warm, fed freely on vegetables and given plenty of exercise. Every person should understand that the sanitary arrangements of poultry yards and buildings are even more essential than the amount or quality of feed.

I do not make a specialty of growing poultry. It is simply in connection with and supplementary to other farm work. My principal business is making milk and growing fruit and truck for market. What I have accomplished is nothing more than any other farmer can do to a greater or less extent according to his location and circumstances. The question is often asked, "If every body goes into the poultry business will it not glut the market and cease to pay?" When poultry ceases to be a luxury and is as common an article of diet on every workingman's table as beef and pork, it will be time to talk of glutting the market, and even then poultry can be grown at a profit.

One word in regard to incubators. There seems to be a great distrust of incubators by poultry men at large. This is not strange, for there are so many worthless machines in the market which hatch well on paper but whose only mission seems to be to disappoint their purchasers and addle his eggs, that it has made people skeptical. There are thousands of good practical men in the country to-day who say that artificial incubation is not and can never be made a success. I run two machines. I will give you the record of the larger one: During the four winter and spring months I have taken out of that machine some two thousand chicks. It holds five hundred eggs and part of the time was not running at its full capacity for want of buildings to accommodate the young chicks. This machine has always hatched a larger percentage of the eggs, than my best hens. It is perfectly automatic in its action, so much so that it has run a week at a time without varying more than one degree in heat. During this time it has been in the care of different persons. All the care that is required is to turn the eggs and trim the lights.

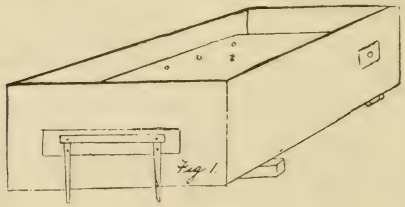
I do not wish to see a hen around in any other capacity than that of an egg producer."

CHAPTER XX.

SUCCESS WITH HOME-MADE MACHINES.

HOME-MADE INCUBATORS—THEIR SUCCESSFUL USE IN NEW JERSEY—DETAILED INSTRUCTIONS FOR MAKING THIS AND OTHER MACHINES—A $25 INCUBATOR THAT DOES THE WORK OF A $300 APPARATUS—A GOOD AND CHEAP BROODER—HOW MADE—THE CARE OF THE INCUBATORS, BROODERS AND CHICKS—PROFITS OF THE SYSTEM.

The poulterers of Burlington county, New Jersey, for a few years past have been having great success in the use of an incubator that can be made for twenty-five dollars, and will hold three hundred eggs each, with brooders that cost only six dollars each and will shelter one hundred chicks. These machines are used with as much satisfaction and profit as are the patent machines costing four times as much, if we may judge from the testimony of those who have used them. The description and detailed



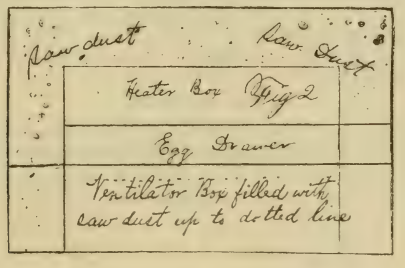
instructions for making this incubator have never before been published. The apparatus is not patented and none of its

parts conflict with existing patents. The inventor has described it exclusively for this work, as follows:

"A reliable and cheap incubator, holding three hundred eggs, may be made in the following manner:

Fig. 1 gives an idea of what is to be made. This incubator is simply an egg-drawer placed between a heater and ventilator box, all three being completely surrounded by an outer box or case holding saw-dust to enclose and retain the heat. A side sectional view showing the internal arrangement and construction is shown in Fig. 2.

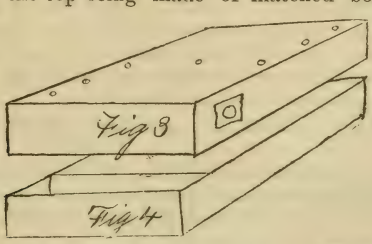
Use well seasoned matched white pine boards one inch in



thickness, for all parts except the sides and ends of the egg-drawer, which should be a quarter of an inch heavier.

THE HEATER

Is made first and is shown in Fig. 3. It is three by four feet and six inches high. It takes two boards six inches wide and four feet long; and two boards six inches wide and two feet ten inches long for the sides; the top being made of matched boards nailed on



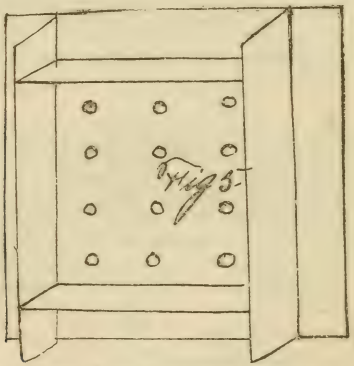
very tightly, and has seven holes bored in it. The center hole is for a three-eighth inch bolt seven inches long, with a large, flat head on one end and a thumb-screw on the other. The other holes are for six escape pipes, which are fifteen inches long and three-fourths of an inch in diameter. Bore three holes on each side three inches from the outside edges of the sides; the first,

three inches from the corner; the second fifteen inches from the corner; the third twenty-seven inches from the corner.

Now cut two holes, eight inches from opposite corners (one is shown in the drawing), in the center of the sides, and four inches in diameter; and over both the inside and outside tack stout pieces of tin containing round holes two and one-half inches in diameter. These holes are for the lamp pipes, and the tin protects the wood from fire. Directly under each of these holes inside, nail a piece of tin a foot square, putting it half an inch from the bottom, bending down the two corners not nailed half an inch. When the zinc is nailed on, this will make two thicknesses with half an inch air space, and will prevent over-heating below the lamp pipes. Use stout zinc for covering the bottom, with a hole for the bolt in the center of it. Nail it on with double rows of lath nails, and it will be air tight. Put the bolt in and tighten up the thumb screw.

THE DRAWER,

Fig. 4, is five inches deep in front, four feet nine inches long, and two feet eleven one-half wide. After saving a space in front, eight inches wide, for saw dust, take a piece of heavy, coarse muslin or tow, and stretch tightly over the bottom and fasten



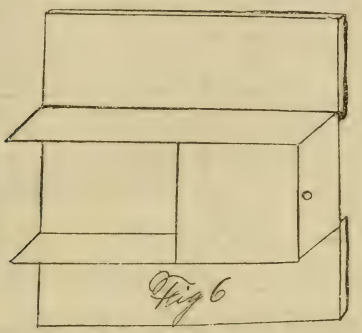
with tacks. Nail a board nine inches wide under the front space for saw-dust, but cover the other parts with slats, one inch square, nailing them on crosswise through the two and place them about an inch apart.

A very convenient and complete egg-turner may be made by making a frame with beveled cross-slats. This should be three inches shorter than the drawer, and just wide enough to slide nicely. The sides of the frame should be seven-eighths by three-eighths of an inch; the ends, seven-eighths square. The slats are seven-eighths of an inch high and one-half an inch across the bottom, and are one and seven-eighths inches apart at the top. It

is well to put the rows two inches apart for extra large eggs or duck or turkey eggs. By moving or sliding this frame back and forth, the eggs turn very nicely.

THE VENTILATOR BOX

With the bottom of the incubator, is represented standing upright in Fig. 5. The box proper is three by four feet, the same as the heater, but eight inches high. By noticing the drawing, it will be perceived that the bottom of the incubator is eight inches larger every way than the ventilator box, and that the same matched boards answer for both. The twelve half-inch holes are for twelve tin pipes to furnish ventilation from below. These pipes



are eight inches long. The sides of the ventilator box extend out even with the bottom of the incubator for the drawer to slide on.

Having made this, place the drawer on it, and the heater on the drawer, and fasten the heater and ventilator together with boards nailed on the sides and back. The boards should be one foot wide, and be nailed so as to allow the drawer to work nicely between the heater and ventilator. These boards on the sides must project the same at the front as do the sides of the ventilator. Next fit an eight-inch board over the front of the drawer, keeping it level with the zinc. This keeps the saw-dust from falling into the drawer.

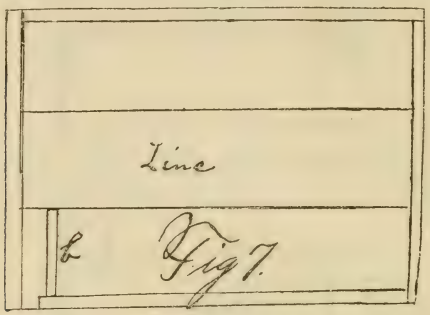
Now with the bottom as a guide, build the outer box for saw-dust, making it nine inches higher than the bottom of the heater, and taking care to fit the front boards around the end of the drawer nicely. To allow the lamp pipes to enter, cut holes in the outer box the same as was done in the heater, but using tins on the outside only. Where the lamp pipes pass through the saw-dust, a box for sand must be made of sufficient size to properly protect the saw-dust. The tinsmith must make the lamp and escape pipes, as stovepipe is made, but the ventilator pipes may be soldered, as they are in no danger of melting. The escape pipes must be cut off so as to come to a point, so that when

they are pushed down and touch the zinc only a small draft is allowed, and the draft can not become closed.

THE LAMP PIPES

Should be two and one-half inches in diameter, with an elbow in the middle allowing the pipe to enter the heater three inches at one end, and to fit a tin chimney with an isinglass window in it one inch in diameter at the other end. A large fount lamp with a No. 2 burner is placed on a slide that can be pushed under the incubator (as shown in Fig. 1), when removed for trimming.

The legs and handle are shown on the front of the drawer,



and can readily be made from looking at the drawing. The legs hold up the drawer when drawn out, and the handle is merely a cross piece fastened to them. The legs are three inches below the bottom of the incubator, and they just clear the floor when the incubator is on two pieces of scantling to allow air to pass up through the pipes.

AFTER SETTING THE INCUBATOR

in the place where it is to be used, put sand in the boxes around the lamp pipes, and put saw-dust in the ventilator-box up to within one inch of the top of the pipes; also in front of the drawer and all around the sides, and on top of the heater up to within an inch of the top of the escape pipes, being careful not to allow any saw-dast to get in the pipes. Cover the saw-dust with paper, allowing the pipes to be open.

You are now ready to light the lamps. Use head light oil (150° test), keep the lamps at a medium height and in a few days you will have the incubator thoroughly heated. By observing the two good thermometers in the front and back ends of the drawer you can easily keep the temperature at 103° by turning the lamp screw up or down. When you have the machine under proper control, put the eggs in, and in about twelve hours they will be warm enough without turning up the lamps, and they will remain so unless the lamps are changed when filled and trimmed.

By trimming every other day and filling daily, the tempera-

ture can easily be kept uniform by looking at the thermometers every six hours and turning the lamps up or down. From 102° to 105° is the proper temperature. Good, reliable thermometers must be used and the bulbs should rest on the eggs with the top slightly elevated.

Turn the eggs three times a day when you look at the thermometer. The eggs should be marked so that you can see at a glance if they are perfectly turned. This is best done by putting a particular mark on each side of every egg, so that all the marks will be readily seen to be alike after turning.

AFTER THE EGGS HAVE BEEN IN THREE DAYS

place four shallow pans of water on the saw-dust under the egg drawer, two in front and two at the back and never let them get empty. The moisture from these pans is sufficient until the eighth day, when a little warm water should be sprinkled over the eggs once a day, until the twelfth day, when two sprinklings will be needed until the fifteenth day. After that three sprinklings daily is given until hatching. During hatching a thin hot cloth may be put over the eggs, if the chicks seem inclined to stick to the shells.

After being in the machine five days all infertile eggs may readily be told by examining them with a tester. A good tester is made by placing a lamp in a pasteboard box with a hole in the top for the escape of the smoke and one in the side opposite the light against which to place the egg. The testing must be done in a dark room, and the hole against which the egg is held should be covered with cloth on the edges to perfectly shut out the light. All clear eggs are infertile and only those with dark or clouded places in them contain germs. The infertile eggs are excellent food for young chicks, and should be boiled for half an hour and put away in a dry place until they are needed.

After the eggs are pipped, do not use the turner to turn them, but keep all the pipped ones turned up or at the side ; and examine the others occasionally, so that all may have pips up to prevent smothering. The chicks will come out themselves and should not be helped except in extreme cases. After the chicks are nicely dried off and are able to walk about, they must be removed from the drawer to baskets and when about a day old placed under the brooder and fed. Keep the shells removed from the drawer and avoid opening too frequently or for long periods.

THE BROODER,

Like the incubator, has a heater which is four feet long, one foot wide and six inches high. The top is covered with zinc nailed on tightly. There is no bottom except over one-third of the back end. The front has a sliding door with a window to look at the lamp. The inside of the sides are lined with tin, and the chimney hole is one inch from the bottom in the middle of the back, and is for a tin pipe one and three-eighths inches in diameter. The

heater is shown in Fig. 6, giving a bottom view without the sliding door in front, and with boards one foot wide nailed on the top through the zinc.

Fig. 7 gives a top view of the same after strips two inches wide have been fitted in at each end of the zinc to make a level surface all around the edge. Before the strips, also two inches wide, have been nailed all around the edge, except to *a*, which is an opening one and one-half inches wide to admit fresh air ; *b* is a strip ten inches long nailed on to conduct the fresh air to the zinc.

Now if this is covered with matched boards there will be a warm fresh-air chamber two inches deep over the zinc and one inch elsewhere. Bore a hole in the centre for a pipe three inches long and one and one-eighth in diameter. Around this pipe on this floor the chicks keep warm. They sleep under a cover, also made of matched boards, two inches smaller every way than the floor. This cover has four round legs which go through holes and raise and lower by means of nails, used as pegs in the stay pieces. Around the edge of the cover, hang down tack carpet or blanket cut in slits every four inches so that the chicks may run in and out. The blanket should be four inches wide and the cover kept two and one-half inches from the floor, when the chicks are first put in the brooder. The warm air is thus constantly flowing over their backs and ventilation is perfect. A tin chimney twenty inches long will carry off the fumes from the lamp.

Put the brooder under a warm, sunny shed, and set it in the ground, or bank up nearly level with the floor and make a pit for the lamp with an open cover. Be careful not to cover the hole where the fresh air enters the brooder. A brooder house may be made of hotbed sash for $12 large enough for three brooders and three hundred chicks. Place the lamp as far under as you can reach, using straight tin chimneys with isinglass windows in them. The same kind of lamps and oil should be used as directed for the incubator. The lamp need not be turned up high, nor must the chimney be nearer the zinc than two inches, 8° is warm enough for them. No thermometer need be used in the brooder. Keep dry sand on the floor and clean off the droppings every morning. Let their run be small at first and do not let them out when young in damp or stormy weather.

Feed them in troughs with covers which will only permit them to stick their heads in. This will save feed and keep the feed clean. Feed every three hours and only as much as they will eat up clean. Their first feed should be hard boiled eggs chopped fine and bread crumbs wet with milk. After a few days scalded Indian meal or cracked corn may be given, as well as a little green food. Onions chopped fine are very good mixed with the feed. A little red pepper sprinkled on their food occasionally gives them an appetite.

If at first the chicks do not use the brooder they have to be

put under it and looked after. Generally they are very little trouble after the first half day. One hundred is enough for one brooder.

By varying their food, giving them plenty of milk and keeping clean water by them all the time, as well as having regard to cleanliness and ventilation, any one will succeed in rearing broilers in nine or ten weeks.

Thousands of broilers are being raised every year with these incubators and brooders with great profit and much more satisfaction than by hens. Any one who tries rearing poultry by artificial means must attend to his business, and remember that failure in all avocations is generally caused by inattention much more frequently than by anything else.

The most profitable time to sell poultry is in April. Operations should therefore be commenced in January. If care is taken to use good eggs and they are turned and sprinkled as directed, success in hatching is assured. A uniform heat of 103° is best, but slight variation in temperature for short periods do not injure the eggs. Do not keep the brooder too warm nor allow the lamps to get empty. Feed regularly, and keep the chicks dry and clean, and in well ventilated quarters they will grow, and be a source of great profit as well as pleasure.

The expensive buildings, and patent, high-priced incubators and brooders may do for those who raise poultry for pleasure rather than profit, and have plenty of money; but convenient substantial brooder houses and an incubator like many of us are using, involves but little outlay for the profit received.

To operate an incubator successfully is not an arduous task, nor is there much trouble attending it. The lamps have been filled and lighted a few days before you wish to place the eggs in the drawer, and having the machine running at a temperature ranging from 103° to 105°, the work of marking three hundred eggs so that you will know that they are all properly turned at a glance, when you slide the turner, is about the same work as marking the same number for nests. To place them in a drawer, between the slats of the turner, is much less trouble, and much more pleasant than carrying them out of doors to twenty different places in each of which a suitable nest must be made. There are a few easy but important labors to be attended to daily and at regular times, such as attending to the lamps, turning the eggs with the turner, and looking at the thermometers four times a day, sprinkling the eggs at certain periods and airing them; the eggs should be tested once in order to save the infertile ones for feed for the young chicks. During the time for hatching, the incubator, like the hens, needs more attention, as the egg-shells and dry chicks must be taken out, and the pipped eggs kept turned so that the pip is up, and the chick will not smother. This work all being in the house, is very easily attended to by a person of ordinary intelligence and judgment, with more satisfactory results than often obtained from an incubator having clock work, batter-

ies, thermostatic bars, mercurial balances, and other delicate contrivances intended to make it self-regulating.

An incubator can be used at any time, but hens only sit when they get ready. The proper time to commence using one is in January, not later than the middle of the month, so as to have the chicks reared by the first of May. As a rule, most hens want to sit in April or May and their broods are not often sold till fall or winter. To attend to sitting hens is often a troublesome task. Some are disturbed by rats, and have to be moved to better quarters, which are not always acceptable, for they go back to their old nests when they leave their eggs for food and exercise ; the eggs get spoiled, unless you fasten the bird in, and then you have to put her off and on every day. Others sometimes leave their nests, the eggs get cold, the germ dies and they will not hatch. If you find their eggs before it is too late, you must either put them under another hen that may happen to want to sit, or else divide them among those who now have full nests, or ought to have, unless some heavy hens have broken some of their eggs, in which case the nests have to be cleaned out, fresh straw put in, the smeared eggs washed off with warm water, or else the nests will smell badly and the chicks die in the shells for want of air.

One hen is as well satisfied sitting on a rotten or a china egg in the nest box, as if on a full nest. She has to be moved, fastened in, and put on and off her nest every day, the same as other hens that are driven off by laying hens. The hens are troubled with lice sometimes, and will leave their nests unless attended to, while the laying hens break eggs by crowding on the nests with the sitters, and have their eggs spoiled if not hunted out in time. Some of the hens hatch well, some poorly, and some fail to hatch an egg. To go around to the different nests, throw out the shells and take in the chickens several times a day, requires much time and gives much annoyance. Many eggs get smashed after being pipped, chicks are trampled to death, some hens leave their nests with one or two chicks, and those eggs which are pipped as well as the rest are ruined.

None of these things bother one in running an incubator.

But the trouble does not end here. After selecting, as you think, good, careful mothers and have them in the coops, you find that some hens will peck and kill all the black chicks. Others will do the same with the white ones, while others trample them and eat up all the best food. You try other mothers for them with more satisfactory results. To visit these coops several times a day and feed and water them, as well as occasionally clean out or move the coops, is quite a job, particularly after they are allowed to run, and you want to fasten them up for the night. You never have this trouble with brooders.

Incubators will generally hatch better than hens during the winter season. From three hundred eggs it is quite common to

hatch five-sixths of the fertile ones, frequently more, and occasionally less.

To take the motherless little creatures out of doors, and introduce them to their foster mothers, when about a day old, is a pleasant and interesting task. By looking after them occasionally, they soon become accustomed to the brooders, running in and out really as contented and happy as if they had a live mother who clucked to them, instead of a silent, inanimate contrivance made of zinc, wood, and a strip of blanket.

It being natural or instinctive for young chicks to eat, the same as other very young animals, they do not require any hens to call and teach them, much less, eat up a large portion of their best food, consisting of hard-boiled infertile eggs, oat meal raw or cooked, broken rice, meat and other things which will make them grow much more rapidly than a diet exclusively of cracked corn or meal, such as is generally thrown in the coops or feeding places on dirty boards, or on the ground, much of which gets wasted or else is unfit to be eaten.

To feed the little fellows with the most economy as well as satisfaction, covered troughs should be used for food and drink to prevent waste as well as preserve cleanliness, not only of food, but of themselves, thereby promoting vigorous health and allowing a rapid growth, until about the first of May, when they are fit to be killed, and readily sold at a high price.

It is much cheaper to use brooders than to take up the time of the hens, when they might be laying eggs enough to pay a large part of the expenses. The cost of running a brooder is less than two cents a day for oil, as very little heat is required—not over eighty degrees after the first few days.

In brooders the chicks are never troubled with lice, never get trampled or pecked to death by careless or cross hens ; they are always dry and warm, no matter what kind of weather there is ; they are easily kept clean, with a few minutes labor each day, by cleaning off the floor where they stand and saving their droppings, and, besides all these things, they are healthier and stronger and grow more rapidly than with hens.

My experience in using these brooders has been such that I consider them preferable to hens in every respect, as a much larger percentage of the chicks can be raised and with less trouble and more profit.

Those who have never seen chicks raised by brooders, have no idea how easily one can take care of several hundred, or how quickly they grow and become a source of great profit. They need attention, it is true ; but that attention must be given at the right time, and in the proper manner, the same as you must attend to anything else in order to be successful.

PROFITS.

To estimate the profits of poultry-raising from results frequently obtained from actual trial and experiment, is just as proper as to estimate profits on new grapes, berries, fruit, or

anything else. The following statement concerning the results of raising poultry artificially, is based on the practical experience, not only of myself, but of many others who have given this business a fair trial.

By using one incubator holding three hundred eggs, four hatches can be secured by the middle of April, if operations are commenced in January. During that time with proper care, there can be hatched from twelve hundred eggs, which have been carefully gathered from good, healthy hens, at least nine hundred chicks. With six brooders, in warm, sunny sheds, with sash fronts and proper attention, eight hundred of these can be raised to weigh one and a half or two pounds each in ten or twelve weeks. By the last week in April the first lot is ready for market; three weeks after the second hatch is fit, and by the last of June both the third and fourth hatches are ready and sold. The first killing will bring from sixty-five to seventy-five cents a pound, the eight hundred chicks weighing twelve hundred pounds, will bring $600.

Those who have kept a careful account assert that it costs but ten cents to feed a chicken ten weeks, when it will weigh from one and a half to two pounds. The expenses for every thing attending the four hatches are as follows:

1 incubator, holding 300 eggs,	$25.00
6 brooders at $6 each,	36.00
1200 eggs, at an average of 2c each,	24.00
Feed for 800 chicks at 10c each,	80.00
Oil for incubators and brooders,	4.00
Total expense,	$169.00

Being a profit of $431.00, calling the gross proceeds $600, as above stated.

One person can successfully manage three such incubators and the necessary brooders, by having a handy half-grown boy to assist in the less important work, and have a profit of over $1200 on broiling chickens alone, besides paying for the incubators and brooders, which can be used to raise fall and winter chickens in large numbers, much more cheaply and with greater profit than those who, at this time, the middle of April, are only commencing business by setting their hens.

Those who keep pure, new or fancy poultry, and sell the eggs as well as the fowls, will find incubators invaluable. With them, the stock can be rapidly increased early in the season, before there is any demand for eggs, and thereby obtain earlier layers, and finer exhibition stock.

Any one who takes pleasure in raising chickens, for either the fall or spring market, and understands how to manage them properly, by using incubators or brooders, the profits can readily be doubled, with half the labor.

In several years' experience with incubators, I never have had a poorer hatch than sixty per cent of the fertile eggs, and

have had as high as ninety per cent to live, but generally only about eighty per cent. This last is better than is generally accomplished with hens. The chicks I have hatched always come out strong and healthy, and grew as well as any I ever had hatched by the natural process.

Those who have heard that incubators are not reliable, or that the chickens can not be raised without hens, because they are puny and unhealthy when hatched, before believing such reports had better visit some grower of poultry by the artificial system, and see for themselves what large and fine lots some of them have before hens generally want to sit.

If you desire to try this artificial method, procure a good incubator, use good eggs, run it with care, provide suitable sheds or houses for brooders which warm the chicks as nearly like a hen as possible, have proper ventilation, keep the chicks dry and clean, and feed frequently on a varied diet, and you will be successful.

CHAPTER XXI.

MORE HOME-MADE INCUBATORS AND BROODERS.

ANOTHER GOOD AND CHEAP MACHINE—ONE THAT CAN BE MADE FOR $20 AS GOOD AS A $200 INCUBATOR—DETAILS OF CONSTRUCTION—BROODERS—THEIR CONSTRUCTION AND USE.

A correspondent of the Indiana Farmer gives the following description of a home-made incubator which he claims to have used with practical success:

"The great drawback to most incubators, is their extreme high price, and their complicated construction. I have examined nearly all of the best machines, and those meriting the most praise are either so costly as to be out of reach of the general public, or so complicated as not to be understood and consequently soon get out of repair and are cast aside and condemned. The requisite beyond all other with successful machines, is uniformity of temperature. Next is moisture and ventilation. With these three ends attained, eggs can be hatched with little or no difficulty. Bearing this in mind, and also the cheapness of the material employed in the construction of even the most expensive of these devices, the question very naturally arises: "Why would I pay two or three hundred dollars for a machine that I can make for fifteen or twenty dollars without infringing on anybody's patent?" Any individual with ordinary ingenuity can with the plans and instructions herewith given, construct a machine that will hatch on an average eighty-five per cent of all the healthy eggs put in it. It is not best to make them too small, as it requires more attention to regulate the temperature or heat in a small machine, than a large one; and again, a one-thousand-egg machine can be made very nearly as cheaply as one holding half that number. The plans submitted here, are for an egg incubator. Those persons who are not accustomed to using a soldering iron and tinner's scissors, will probably find it best to have the

tank and lamp made by a tinner ; and if desired, you may secure a better result in the wood work, by employing the services of a carpenter.

To give an idea of the general outward appearance of the machine, I might say that it looks very much like a carpenter's tool chest, if the latter was placed on legs eighteen inches high. It should be made of one inch poplar or pine lumber (seasoned) with double walls leaving an interspace of one and one-half inches to be tightly filled with sawdust. A very convenient size and holding about one thousand eggs, is five feet long (outside), two feet and eleven inches wide and about two feet eight inches deep.

The legs should be three inches in diameter where they enter the machine and half this at the lower end. The required degree of heat is maintained by means of hot water in four broad flat tanks ; one over each egg-tray ; the water being kept warm by the heat of two coal oil lamps under the lower tank. As the water circulates freely from one tank to another, a uniformity of heat is also secured. The smoke from the lamp passes upward through the flues and does not come in contact with the eggs. The lamp flues are two tin tubes, one and one-fourth inch in diameter, passing from the lamp-box outward to the wall of the incubator, thence upward through the sawdust, and should project above the top of the machine about six inches ; they should also have a slight enlargement in the tube just before they pass through the lid in order to produce a draft.

There should be sufficient room between the top of the upper tank and the under surface of the box, to admit of the thermometer lying under the little glass door with a small piece of cloth or wood under it. I would also suggest, that the wood-work be put together with screws, so that it may be more easily taken apart should any trouble occur from insufficient ventilation, leaking of the tank or other cause. The apertures for ventilation should be one inch in diameter, and should have tin tubes fitted in them, corresponding in length with the width or thickness of the walls. They should be arranged to close externally with small wooden buttons, constructed to slide over them. The glass over the thermometer should be fitted tightly into the lower side of the upper wall with putty, and the little door over it, made to fit closely in its place.

There should be a section cut out of the centre of the floor, fifteen inches long by eight in width, to receive the lamp-box ; the lamp-box will be fifteen inches long, eight inches wide and twelve inches deep ; fitting closely to the under side of the tank ; having a door on one side its full length, and one or more ventilators as may be required. The lamp should be a square cornered box, twelve inches long, five inches wide by one and one-half inches in depth ; should be made of tin, with an ordinary lamp-burner soldered on the top near each end ; should have a

one-fourth inch tube passing from the lamp-chamber outward through the wall of the lamp-box, so that the lamp may be filled from the outside.

The water-gauge is a tin tube, one inch in diameter, with a small strip of glass covering and forming its upper side ; the tube being on a level with, and passing into the upper tank near its surface ; this allows the water to run out into the tube ; and the depth of the water can be seen through the glass. The large door at the end of the machine should fit snugly and nicely, and if necessary, small strips of cloth may be tacked on its edges to insure a more perfect fit. The inside door containing the glass should also admit as little air as possible and should hang on hinges. There should also be two or more ventilators in the rear end of the machine.

The tanks which should be made of sheet zinc, or some other material impervious to rust, should be four and one-half feet in length, two and one-fourth feet in width, by three inches in thickness. They should be connected by an upright tank of the same width and thickness, in the rear end of the machine, which in a four-tank machine should be two feet high. There should be a strip of heavy copper in the centre of the bottom of the lower tank, as the heat of two lamps would soon burn a hole in the zinc ; this strip should correspond in width and thickness with the lamp-box. The space between the tanks should be at least four inches and five would be still better. Strips of heavy zinc or other metal should be soldered on each side of the tanks near the forward end, as supports. There should be a stop-cock in the front end of the lower tank, to draw off the water when desired. There should be two open tubes passing down into the upper tank, so that the air may escape through one as the water is entering the other. That end of the tube fastened to the tank, should not project more than three-fourths of an inch, so that after the tank is put in they may be passed through the walls and fitted on from the outside.

The egg-tray should correspond in length and width with the horizontal tanks ; and should be at least two inches deep internally. The compartments should be about three inches square, and lined on the sides with heavy canton flannel, pasted on with glue ; this prevents injury to the eggs by rolling against the sides of the tray when turning the eggs over. The sides should be of one-inch lumber and the partitions of one-half inch. The top and bottom of these trays should be just alike, and should be a frame on hinges covered with open wire gauze or netting ; the wire being of some material that will not rust—the apertures in this netting should not be large enough to allow the feet of the chicken to become entangled when hatched.

The vapor pans are small, shallow zinc trays two and one-fourth feet in length, four inches in width, by three-fourths of an inch in depth ; three to be placed on each tank, one in the middle and one at each end. These pans are intended to contain water,

the vaporization of which, from the heat of the tanks, will produce sufficient moisture for the supply of the eggs, and without which the eggs would dry up. The machine should be filled with water previously heated to the proper degree and the heat regulated before the eggs are put in. The temperature can be successfully controlled by keeping the lamps at one height and by watching the thermometer closely until the heat becomes regular. If you desire an "electric" regulator go to any electrician and procure an ordinary thermostat, which you can correct with a valve to open and close as the temperature gets too high or low, or with a bell to ring from the same cause ; the entire electric apparatus will cost you only about $3.

The eggs should be turned every six hours by withdrawing the tray and returning it the other side up. The objection urged by some incubator men to machines having one tray over the other, is entirely unfounded, and is based on a desire to find some fault with every one else's invention but their own. The tanks, however, should be far enough apart so that the eggs will be hatched by the heat from the tank above it, rather than that below, as the germ floats on top of the egg and this is the part of it that requires the heat. Keep the temperature as near 103° or 104° Fahr., as possible. Use fresh fertile eggs and keep the ventilators open, and your success is assured.

BROODERS.

D. D. Briggs, of Los Gatos, Cal., who has been very successful in artificial poultry raising, writes :

I have been led after six years of experience, four of them practical, to the adoption of the following plans : I divide the life of a chick into three parts or grades : First—the first seven days after hatching, second—the next fourteen days, third—the intervals elapsing until they go onto the perches.

For the first grade I have devised and constructed a brooder, six feet across the front, four feet in depth, and six feet in height. The walls are of common rough lumber and battened ; the roof is made of shakes and has a sharp pitch each way, the gables closed with grain sacks for better ventilation. There are set in

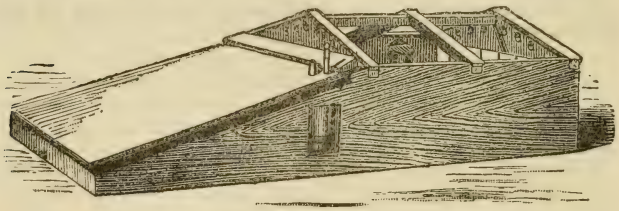


Fig. 19.

the front three sash doors 24 by 30 inches each, and made to swing outward for convenience in getting to the chicks.

About one-half of the interior is floored and sanded. Six inches below the sash doors, a solid door is hung to admit of lighting the lamp, etc. There are three compartments, separated one from the other by means of wire cloth or netting, about eighteen inches high from front to rear, and situated in front of the mother, with height sufficient to permit the ready egress and ingress of the chicks. Such a house as described can be built at a cost not exceeding $6.50. The material employed consists of one hundred and fifty feet of lumber, four pairs of strap hinges, three sashes, fifty shakes, and two pounds of nails. As soon as the chicks are dry I place them in this brooder, in the sun if it is shining brightly, if not, then they are placed with the mother, taking care to provide a shady retreat which the chicks will seek if it should become too warm.

With the sun obscured, and in need of warmth, they will seek the mother when near at hand. At times the little ones

will persist in remaining out all day and so getting cold. A very good remedy for this is to cover the glass with something dark to convey to them an idea that night is approaching. As soon as they have learned to seek their resting places for the night without prompting, usually in about a week, I put them in a larger brooder with larger runs, and only twenty-five together, giving them plenty of light and ventilating much the same as in the first instance. Here they remain for two weeks longer before being allowed their entire freedom.

If you want the chicks to feather early keep them quite warm. When transferred from brooder No. 2 to No. 3, they may be allowed a limited out-door range if not too cold. Until well feathered I never allow them out in early morning or in rainy weather. The feed for the first week is hard boiled eggs and dry cracked wheat, water provided should be clean and pure. The wheat is continued for the second and third weeks with lettuce added. When they begin to run out, soft feed of bran and middlings should be given sparingly at first, using only clear water in mixing.

To provide the artificial heat necessary several devices have been employed; perhaps none better than the artificial mother illustrated above. This may be made of any capacity required; a very convenient size is one that will accommodate fifty chickens until three months old. Two feet wide and four feet long; the sides are twelve inches high under the glass, sloping to three inches at the back; the cover of the back or inclined part should be movable, and lined with sheepskin or with pieces of flannel cut into strips three inches wide, and tacked to the under surface of the lid so as to hang down lengthwise with the lid; from the highest part of the lid should hang a curtain made of flannel, all across the box, and to within half an inch of the floor; this keeps the cold air out of their roosting place. The front half of the brooder is covered with four panes of glass, this admits the sun. The black dots in each peak are intended to represent one-inch holes for ventilation.

An ordinary stone gallon jug (placed beneath the lid) filled with hot water four or five times a day, will furnish all the heat

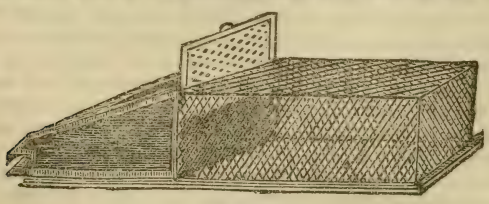


Fig. 20.

necessary. Feed little and often, and a variety for the first few days, the yolk of hard boiled eggs, then coarse Indian meal

scalded or baked, occasionally onions, cabbage or meat chopped very fine ; after a month old feed cracked corn or wheat screenings at night. Always season their soft food with pepper and salt, as if preparing it for your own use, but on cold or wet days add more pepper.

Fig. 20 represents an artificial mother for out-door use, and a wire run for the chicks. It is very simple in its construction ; it is made on the same principal as the mother previously described, excepting the bottom is separate from the body of the coop, which can be removed to clean. It is very important that it should be kept free from the droppings of the chicks, for if they are allowed to accumulate they will breed lice. If the weather should be too cold for the comfort of the chicks then a jug of hot water should be placed within the box ; this will not be necessary unless very cold, as a large number of chicks huddled together will generate a considerable amount of heat.

The following description of the Jacques incubator has been extensively sold for 50c, the price of this whole work. We do not consider this Jacques machine as of any value for practical business.

"In order to make the incubator herein described, you need only the following articles: a good sugar barrel, a round tin clothes boiler about twelve inches deep see Fig. 1, a tin milk

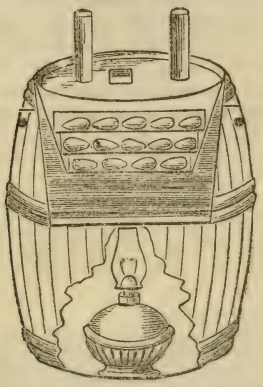
1

2

3

pan, see Fig. 2 and a kerosene lamp with chimney. Have a barrel without a head, place in it the boiler, which must be the size of the barrel so it can be supported in its place by its rim resting on the chime of the barrel. The pan must be of such a size, as when it is placed in the boiler (as in Fig. 3) it will have a space of about five inches between it and the bottom of the boiler. It will be necessary to solder the pan in this position. All the space between the pan and the boiler must be filled with water ; this can be done by punching a small hole in the side of the pan near the top, and inserting a funnel. It will not be necessary to refill in three weeks, as the evaporation is so slow you will not lose a quart. Make a door in the side of the barrel near the bottom, of sufficient size to admit the placing of the lamp under the boiler. Cover the outside of the barrel with four or five thicknesses of paper, well pasted on, to secure heat in the barrel. Bore two one-inch holes in the lower part of the barrel, one on each side, with tubes running from them to the base of the burner of the lamp, in order that the lamp may have a supply of oxygen to

support the flame. Bore three half-inch holes near the top of the barrel, to allow the gas to escape. The cover must be lined and wadded, so it will fit tightly to the boiler, then the heat cannot escape. Cut a hole in the cover 3x4 inches, paste a piece of glass over it; directly under this place the thermometer (which can lie on the upper shelf of eggs), then you can ascertain the temperature without removing the cover; also bore two one-inch holes through the cover, insert a tin tube in each for the purpose of ventilating the egg-chamber. Inside the pan is the egg-chamber, which is of sufficient depth to allow



three layers of eggs; cover the bottom of the pan with a thin layer of cotton, on which place the first layer of eggs, and at equal distance apart around the edge of the pan, put three blocks of wood about two inches square, on which place a round sieve with one-half or three-quarters inch meshes; on the top of this put another sieve larger than the first, so the rim of the lower one will support it. Cover the bottoms of the sieves with a piece of a coffee bag or some other light material, so the heat can pass up through it. The tubes to supply the lamps with air can be made by wrapping a piece of hardware paper around a broom handle three times, pasting it together; after the paste becomes dry, slip it off.

Place the lamp under the boiler, turn on a good flame; when the mercury runs up to one hundred reduce the flame so it can just be seen above the cone of the lamp; keep the temperature at one hundred and three the first week, at one hundred the second, and ninety-eight third week. It is very easy to regulate, provided the temperature of the room is not subject to much variation. In case of very cold weather, close the ventilators at night and place a heavy woolen cover over the whole incubator.

As the eggs need a certain amount of moisture, they should be lightly sprinkled with warm water every day, or as often as is

needed; a good way to ascertain the amount of moisture in the egg-chamber is by keeping in it a small piece of the skin of a salt codfish; this should never be allowed to get so dry as to crack when bending it, nor to be so moist as to become wet, but should always be so you can easily bend it. After the fifth day examine all the eggs by holding them up to a strong light; if any are perfectly clear, remove them, as they are not fertile, yet they are just as good for culinary purposes.

Do not place the eggs in until you have secured, and are able to keep, the right temperature. I use a large bracket lamp, and do not have to fill it oftener than once in twenty-four hours. After the sixth day, turn the eggs daily, which can be done by removing sieve; this will give them an opportunity to cool, as in the case of a sitting hen when off her nest. After the chickens are hatched they can remain in the incubator twenty-four hours, when they should be removed to the artificial mother.

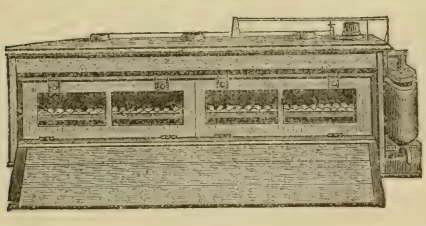
PART THIRD.

ADVERTISEMENTS.

THE IMPROVED

MONARCH

INCUBATOR.



(PATENTED MAY 20, 1881.)

3000 CHICKS FROM ONE MACHINE

IN LESS THAN FOUR MONTHS.

INVENTED, MANUFACTURED AND SOLD BY

JAMES RANKIN, SOUTH EASTON, MASS.

This Machine has made the best public and private record of any Incubator ever invented. It has never hatched less than 90 per cent of the fertile eggs wherever it has been exhibited in public.

The Monarch hatched 500 ducks and chicks at the great Pennsylvania Poultry Show held in Philadelphia, September 24–30, hatching more than 95 per cent of all

the eggs carried. These eggs were taken to Philadelphia in a trunk (a distance of 400 miles), the day before hatching.

The Improved Monarch is substantially built, calculated to last a lifetime, and is the simplest of all self-regulating machines.

We heartily recommend it to everyone in need of a practical machine. We append a few of the many testimonials from men well known to the poultry public, and whose reputation for veracity no one can doubt.

TESTIMONIALS.

The MONARCH won the first Premium at the great competition of Incubators at Madison Square Garden, New York city, February, 1885, for hatching the greatest number of chickens, and the best percentage of the eggs, thirty-two machines competing.

The eggs were carried three hundred miles in a trunk the day before hatching.

TAUNTON, Mass., Jan. 21. 1884.

MR. JAMES RANKIN:

Dear Sir.—We desire to thank you for the fine display you made with your Incubator at our fair last week. It was the center of attraction for all. The fact that you brought about 400 eggs from Easton with the mercury at zero, placed them in the Incubator, and had them hatching the next day, and got a yield of 90 per cent in fine, healthy chickens, is recommendation enough for your machine. Wishing you the success you deserve, we remain,

Yours truly,
F. L. FISH,
President of Southern Mass. Poultry Association.
PHILANDER WILLIAMS,
Vice-President of Southern Mass. Poultry Association

WALTHAM, Mass., Dec. 11, 1884.

The committee on awarding the prize of forty dollars offered by the Waltham Fanciers' club, for the best approved incubator in actual operation hatching chickens during the exhibition, Dec. 9, 10, and 11, 1884, award the prize to the Monarch Incubator, invented and exhibited by James Rankin, of South Easton, Mass. And the committee do hereby certify that the hatch was 95 per cent of 475 eggs which were placed in the incubator the first day the exhibition opened; and that the eggs were out of the incubator three hours and fifteeen minutes in transportation, and were transported forty miles by rail and four miles by carriage road before arriving at the exhibition.

J. H. SWASEY,
W. E. SHEDD,
GEORGE WOOLEY,
} Committee.

FALL RIVER, Mass.

MR. RANKIN:

Dear Sir.—Having tried a number of incubators and found them to be worthless, I was tempted to make another trial, and am pleased to state that the Monarch purchased of you has been a success, having hatched as high as 90 per cent of fertile eggs. My first trial with ducks' eggs was 32 ducks from 340 eggs, or 95 per cent.

Yours truly,
R. G. BUFFINTON.

WEST HANOVER, Mass.

MR. RANKIN:

Dear Sir.—You will be pleased to hear that we have got out 5000 chicks the past spring with our two Monarchs—never hatching less than 90 per cent, and from two hatches getting out 100 per cent from machines full of eggs; hatching every egg with the least sign of fertility. And with good eggs can do the same thing every time.

Yours truly,
E. F. DWELLEY.

BROCTON, Mass., June 11, 1885.

MR. JAMES RANKIN:

Dear Sir.—The following is my experience with the Monarch Incubator: Have hatched with my machine over 1,500 chicks this season. My first hatch I got 80 per cent; my last hatch, 382 chicks from 406 eggs. The machine runs to perfection with me. The regulation is simple and positive, and there is no anxiety to be felt about it. I look at the machine morning, noon and night, and never have any fear of its going wrong—in fact, I consider it the best machine in the market. My chicks are all strong and healthy, and are pronounced by all visitors to be as fine a flock of chicks as they ever saw. What more can I say?

C. O. TRIBON.

MELROSE, Conn., July, 1885.

MR. JAMES RANKIN:

Dear Sir.—The No. 2 Monarch Incubator that I bought of you last winter has been used during the season with good success, giving a better percentage than the average of eggs set under hens, and as nice chicks as were ever hatched in the natural manner. In fact, my chicks were the admiration of all who saw them in the machine. Many visitors saw the Monarch in full operation, and I cannot recall a single instance of disapproval from anyone. The simplicity of your regulator, and the absolute certainty with which it operates, delighted all who saw it, and was highly commended. That it is a self-regulator I can show by my record. I have left the Monarch from 5.30 A. M., until 8 P. M., *unattended*, and found a difference of only one-half degree in temperature. And more than this, I have run the machine for several days at a time without any change of temperature. Give the Monarch ordinary care, and no one needs to be afraid of roasting eggs, or of burning up his machine and buildings. It is a pleasure to use your machine, as it does the work of fifty old hens, with a tithe of the labor; and I venture to say, will hatch more chicks. The distribution of heat in the egg-chamber is perfect, and the arrangement of the egg-drawers is excellent. The Monarch is worthy of the splendid reputation that it has already obtained, and as a first-class machine I heartily recommend it to all.

Yours truly, C. C. ABBE.

SOUTH EASTON, Mass., August, 1885.

JAMES RANKIN, ESQ.:

Dear Sir.—Sometime ago you asked me how the Monarch Incubator worked. In answer I have to say, that it works even better than I expected it would. I had had no experience with incubators, and was obliged to commence at the beginning; and was also obliged to pick up the eggs here and there, wherever I could find them. I had eggs of six different parties. With these disadvantages, I succeeded in hatching 409 chicks from 460 fertile eggs.

The machine works even; the temperature is uniform throughout. I feel quite satisfied that when I can have new eggs from our own hens, the Monarch will hatch every fertile egg, every time. I had taken some pains to examine several kinds of incubators—had taken note of their work, and also taken some evidence of the work from their owners; so that I have no vague idea of what constitutes *a good incubator*, and have no hesitation in saying that for practical utility, taking all in all, the Monarch is decidedly the best.

Yours truly, GUILFORD WHITE.

NORTH MIDDLEBORO', Mass., Jan. 14, 1884.

MR. RANKIN:

Dear Sir.—I am very much pleased with your incubator; it is doing even better than I anticipated. I have got out over 600 chicks within the last six weeks. My last hatch was 215 good, strong, healthy chicks from 250 eggs.

Yours truly, MRS. ADDISON SHAW.

This lady, since writing the above, has up to March 20th, got out 900 more chicks with this machine, making 1,500 in all.

The Improved Monarch Incubator

Is constructed with two cases—the outer one of wood, the inner of galvanized iron,—with an inch dead air space and heavy sheathing paper between. It is furnished with three doors,—the two inner ones of glass, the outside of wood,—while the tank, which is of galvanized iron, and is the source of heat, is packed above and at the sides with heavy hair felting an inch thick. It is of the best workmanship throughout; while every means has been used to render it a complete machine, impervious to outside temperature. It embraces the four cardinal points which are absolutely necessary to success in every incubator.

First.—It is a complete self-regulator.

Second.—There is a perfect uniformity of temperature in every part of the egg-chamber.

Third.—It is so arranged as to give the operator control of any given egg-drawer, to raise or lower the temperature at will.

Fourth.—It generates its own humidity of atmosphere, thus avoiding the necessity of sprinkling the eggs, or the use of wet cloths.

The boiler, tank and pipes are connected together with brass unions, and can be easily detached. The whole machine is so constructed that it can be taken apart in a few minutes.

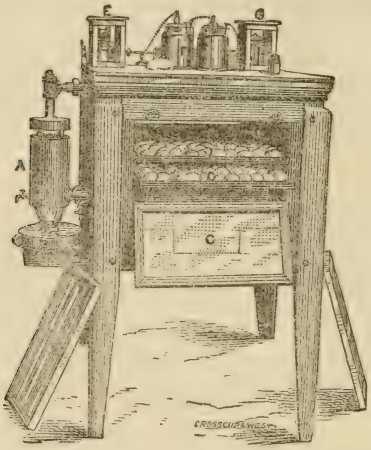
SEND FOR CIRCULAR.

JAMES RANKIN,

SOUTH EASTON, MASS.

CHICKENS

ARTIFICIALLY HATCHED AND RAISED



PERFECT

HATCHER AND BROODER

ARE THE STRONGEST AND HEALTHIEST,

AND OBTAIN THE HIGHEST PRICES.

Chickens by our system can be hatched and raised to three months of age, at a cost of five to eight cents per pound. The prices obtained are from 20 to 80 cents per pound the year through.

CAN YOU SEE THE PROFIT?

The artificial production of poultry is daily increasing in popularity, and is destined to become a great and remunerative industry. It is a business suitable for

all classes of people, and can be conducted with success by the clergyman and his family, as well as the farmer and fancier. It is easily managed, and is already carried on by the sons and daughters of many prominent citizens as well as mechanics, etc. The invention of

The Perfect Hatcher and Brooder

Has completely revolutionized this trade and thousands of chickens are now being hatched weekly to be sold as broilers, for which there is an ever increasing demand, at such prices as cannot fail to be remunerative.

The great problem, never before solved, is how can a young man with a moderate income and a growing family, and a wife who is ambitious to assist in earning and support of family—how can she do her share and still remain at home to care for the children and house.

THIS PROBLEM IS NOW SOLVED BY OUR SYSTEM.

Anyone with a good, ordinary city lot, say 60 x 125 feet, can put up a building that will hold and raise to three months of age 2,600 chicks, and place in the market at least 800 chicks per month, on an average profit of 20 cents each, eight months in the year; they can use our Portable Brooder, if on a rented spot, and place 400 chicks in the market per month, from same space. This business also commends itself to widows with a growing family—clergymen, old people who can do light work, and a host of others to whom most avenues of employment are closed, and remain at home and be independent. The market for this product is unquestioned. See our large circular for facts on this point.

The largest part of our trade to-day is from our old customers, which is

PROOF POSITIVE OF THE MERITS OF OUR SYSTEM.

Our incubator is known throughout the world as the standard incubator. We have during the past year filled orders for the Ostrich Farms in California, besides others for export to the following countries: Japan, Constantinople, Turkey; Brazil, Panama, New Zealand, Gibralter and Barcelona, Spain; Sweden, England, Paris, France; Mexico, Sandwich Islands, and many other parts of the world. All this in addition to our domestic trade, which extends to every part of the Union. We can furnish testimonials by the hundreds—they come in every mail.

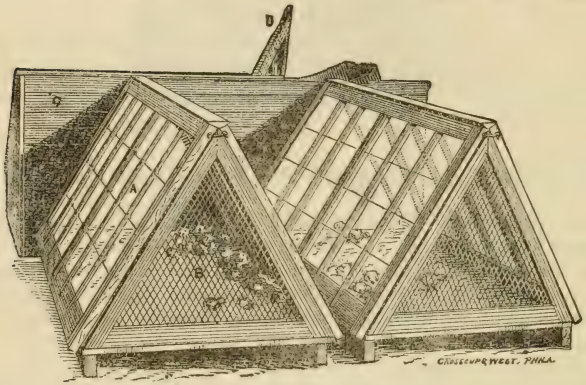
☞ For further facts and information, address,

THE PERFECT HATCHER CO.,

ELMIRA, NEW YORK.

—THE—

PERFECT BROODER.



IN OFFERING OUR BROODER,

With its Latest Improvements,

—We are Confident it is in Every Respect—

What its name implies. We are conscious that our earlier plans of brooders were not a success; but it took time to develop all their defects. We therefore have been steadily advancing, until now we know it will do its work successfully, and is the successor and

RIVAL OF THE NATURAL BROODER—THE HEN.

It is well known by all how she broods her chicks, viz., she sits upon the ground; the chicks run under and around her body, with which they come in contact; they are enveloped in her feathers and are surrounded on all sides by her warmth. She even warms the ground slightly, and thus keeps their feet and legs warm, which we find to be of the utmost importance. It would therefore seem that from the teachings of the mother hen, a successful brooder should long ago have been

devised, but strange as it may seem, we have all gone astray. But we claim now to have solved the problem. The successful brooder must be

BASED UPON THE PRINCIPLE OF THE HEN,

Viz: A comfortable warmth surrounding the chick, a warm floor—but not too warm—and a comfortably warm atmosphere surrounding the chick. The chick needs to lie down and sleep like any other animal. They cannot lie down on a cold floor; it must be warm or they will huddle together, and then the mischief is to pay. The atmosphere must be warm or they will suffer. There must be good ventilation, and constant, or they will be

POISONED BY THEIR OWN CARBONIC GAS,

The same as would result from a dozen people sleeping in a small room with all the doors and windows closed. The brooder must be portable; it must be placed on the ground, so the chicks can run in and out at their pleasure on pleasant days; it must be storm proof, and proof against all animals dangerous to chickens; it must have

AMPLE ROOM FOR THE CHICKS,

So they can be kept inside on all cold and rainy days; it must have a glass run, so that when the wind is sharp in March and April, November and December, the chicks can bask in the sunshine and bid defiance to the cold and shivery winds. It must be of that adjustable character to circumstances and seasons, that it can be placed in a building of any suitable character, or out on the lawn, or in the field, at the

PLEASURE AND CONVENIENCE OF THE OWNER

It must be so arranged that a person can raise the largest number of chicks possible, in a state of health, on the smallest possible spot of ground.

SUCH A BROODER

We offer to the public, to whom we appeal to judge it upon its merits and with good common sense.

Our system of brooding is in every respect equal to our system of hatching, and we can show that a loss of five per cent in raising is too large, if proper care is given.

WE INVITE ALL INTERESTED TO CALL AND SEE US,

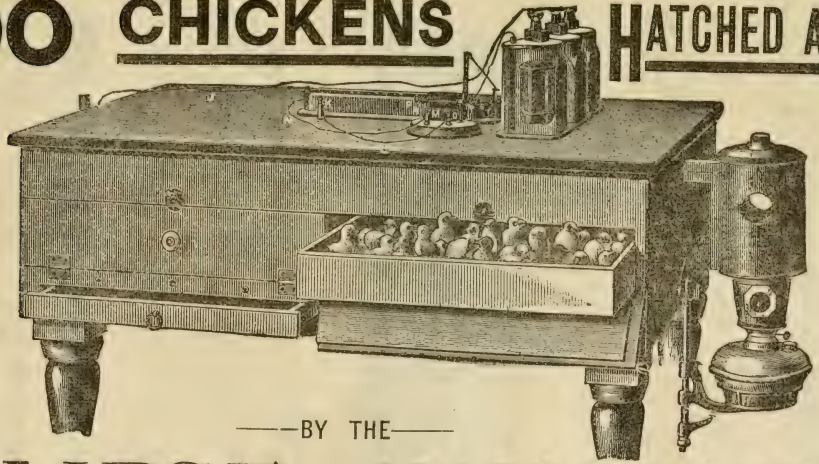
See our factory, our brooding house, which holds 3,500 chickens, and see the chickens themselves. We can prove what we claim.

All information free.

PERFECT HATCHER CO.,

ELMIRA, N. Y.

300 CHICKENS HATCHED AT ONCE.



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——CAN BE OPERATED BY A CHILD——

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WESTERN INCUBATOR,

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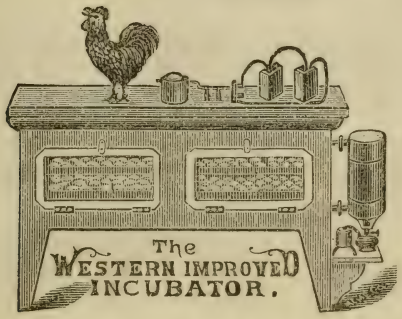

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Drinking Fountains, Egg Testers, Tested Thermometers,

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—IS CALLED TO—

Swan's Standard 2 and 3-ply Roofing

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TARRED FELT FOR LINING.

Cheap, Durable, Fire Proof!

SUITABLE FOR STEEP OR FLAT ROOFS.
CAN BE APPLIED BY ANYONE.
COSTS LESS THAN TIN, SLATE OR SHINGLES.

Is being Used by Farmers and Poultrymen in Every Part of the United States.

Send for samples and circular "How to Build a Cheap Poultry House." Mailed Free on application. Mention this publication.

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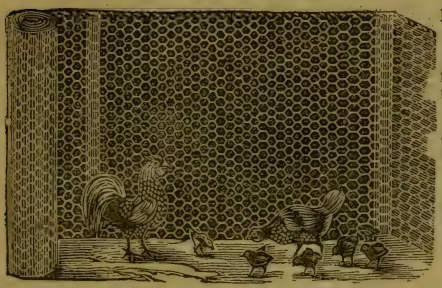
ONE CENT PER SQUARE FOOT,

FOR BEST QUALITY 2 INCH MESH, NO. 19 WIRE.



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of 150 lineal feet:

$3	$3.75	$4.50	$6	$7.50	$9
24	30	36	48	60	72 inch

Write for descriptive circular, with special discount for large lots.

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IT IS NOW ADMITTED BY ALL WHO HAVE USED IT, THAT WIRE NETTING MAKES THE

Best Fence for Poultry

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It is Cheaper than wood because far more durable (being coated with zinc it cannot rust).

MAKES A HANDSOME FENCE,

Admitting light and air freely, and is easily attached to posts and boards by small staples. We furnish Nettings of all sizes and guarantee them to be

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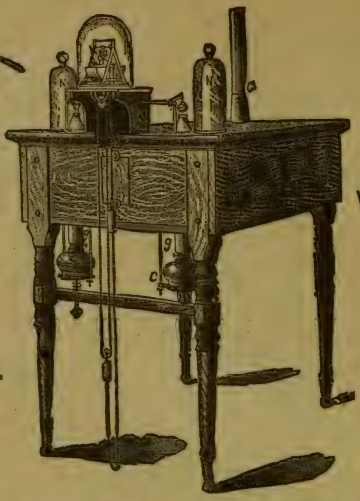

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AUTOMATIC VENTILATION AND SUPPLY OF MOISTURE.

IT IS PERFECTLY RELIABLE,

AS SHOWN BY THE FACT THAT EVERY MACHINE NOW IN USE IS GIVING GOOD RESULTS.

Simon Walsh, Montgomery, N. Y., says: "My last hatch (from a No. 2, Thermostatic Incubator), was 200 Chicks from 218 Eggs put in the machine."

William Newcomb, Tenafly, N. J., hatched 188 Chicks from 198 tested eggs.

EVERY PURCHASER IS DELIGHTED

And anyone about entering the Poultry business should make himself thoroughly acquainted with the merits of my machine.

VENTILATING BROODERS

Apply heat at the bottom, through a perforated floor, thus securing perfect ventilation and full supply of heat. Correspondence solicited. Address

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